Coordinated Mechanical Programs

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Diesel-Hydraulics Face U. S. Test

. . . page 27

RAILWAY

LOCOMOTIVES AND CARS

SEPTEMBER 1960

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TRADE PAPER

Meeting Challenges of Aluminum Welding . . . page 42

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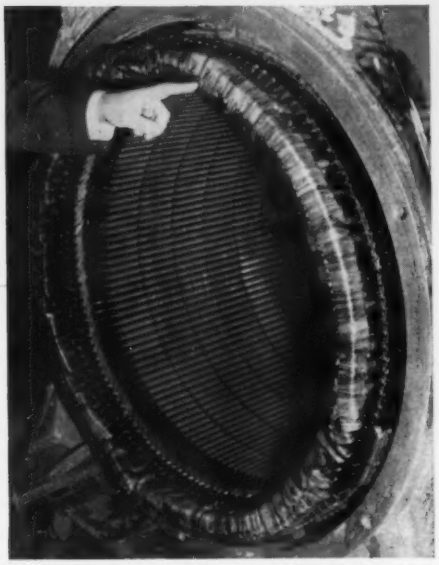

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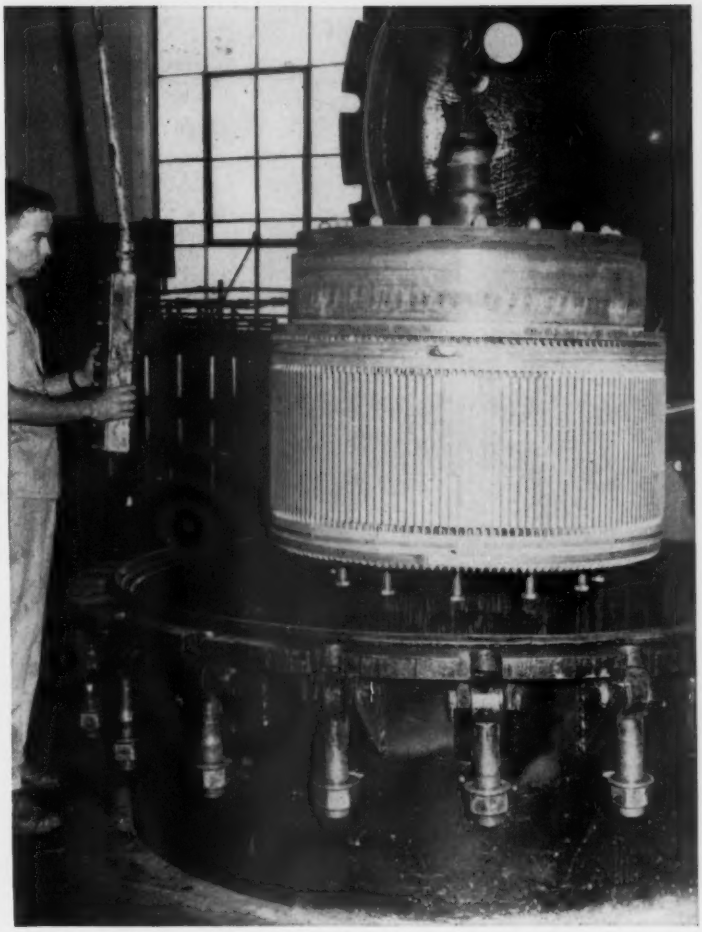

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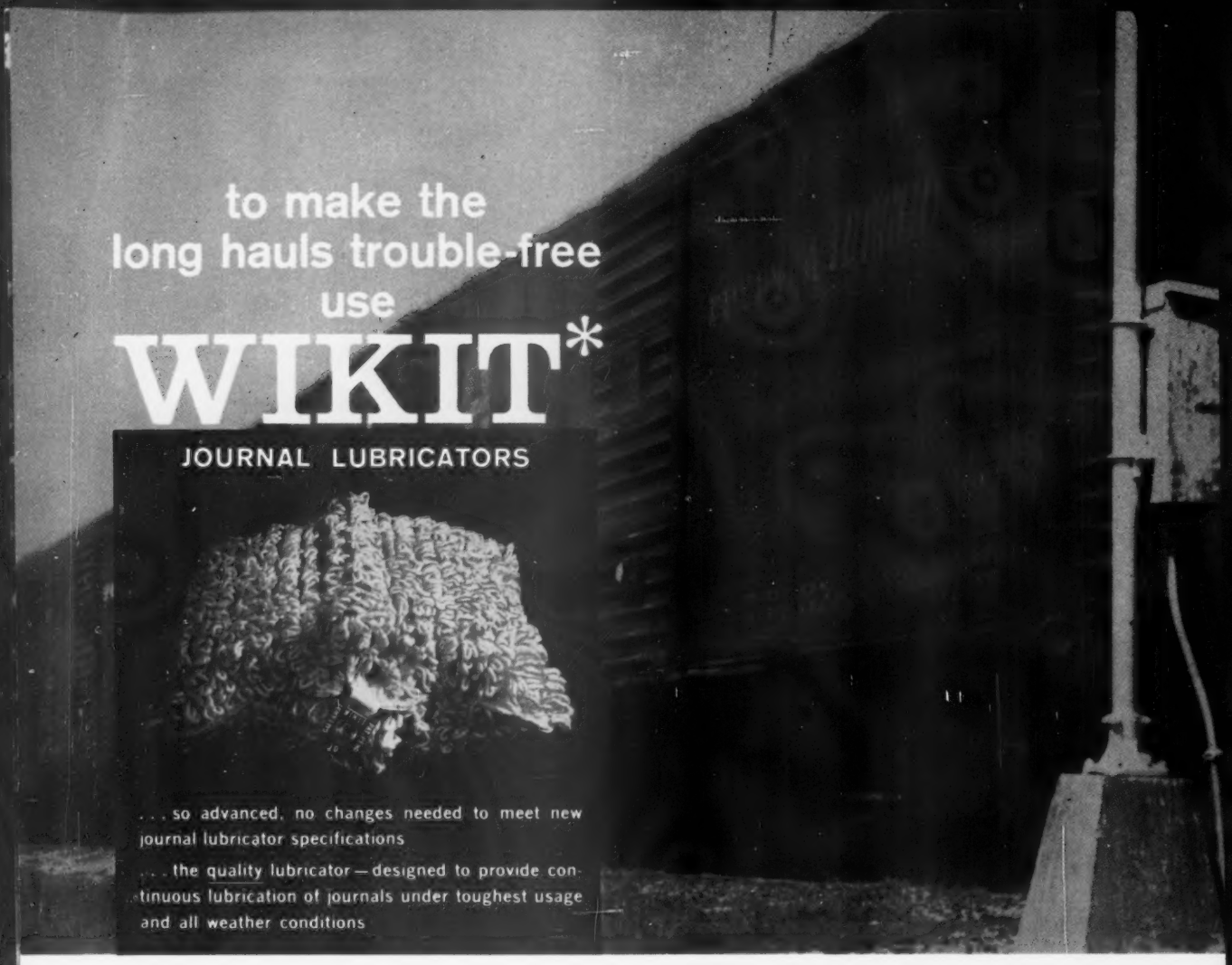

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America's Oldest Trade Paper
September 1960—Vol. 134, No. 9

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REPORT FOR SEPTEMBER

ARSA Exhibits to Cover Two 1961 Conventions

The Allied Railway Supply Association has announced plans for five full days of exhibits during the September 1961 meetings of the Coordinated Mechanical Associations and the Purchases and Stores Division, AAR, in Chicago.

Exhibits will be open September 10 through September 14, 1961. The Coordinated group—the Air Brake, Car Department, Locomotive Maintenance Officers, and Railway Fuel and Operating Officers Association—is meeting September 11, 12 and 13 at the Hotel Sherman. Changing its meeting time from the usual June dates, the P & S Division will meet September 13, 14 and 15 at the Hilton Hotel.

As in 1959, the ARSA is sponsoring in 1961 both exhibits at the Hotel Sherman and a track exhibit. However, the track exhibit will be in a different location—at the Illinois Central's 31st Street yards where 5,000 feet of track space will be available. Free bus transportation will be provided between the Sherman, Hilton and the yards on the regular schedule during the conventions.

'Dark Horse' Diesel?

Sometime this fall a small six-wheel diesel switcher will roll out of Germany's MaK (Maschinenbau Kiel) plant and begin performance tests. To the casual observer, it will be just another standard V-60 diesel-hydraulic of the type widely used in Germany.

The 650-hp German unit will be equipped with the first operational Suri transmission, a development announced only a few months ago by India's Railway Board.

The initial announcement included few details: it was said that the new transmission was capable of optimum efficiency of 95 per cent; that it was not electrical, nor really hydraulic either, and that MaK had been granted a license for its manufacture together with an initial contract for construction of seven locomotives.

M. M. Suri, deputy director (diesels), India's Railway Research, Design and Standards Organization, developed the new transmission. The device on which he now seeks a U.S. patent, he says, is basically a mechanical transmission. Previous attempts at straight mechanical transmissions failed primarily in the starting range. To overcome the problem of starting torque the Suri unit employs a fluid coupling in the first stage. Beyond that, the fluid circuit cuts out and the drive becomes purely mechanical.

One unusual feature of the new transmission is that it employs only a single mechanical stage—no gear changes. A key part of the Suri design is a modified diesel engine delivering relatively constant horsepower over a useful speed range. The design is understood to have been developed in conjunction with Maybach (German) interests, and to be a modification of the standard Maybach engine.

Mr. Suri emphasizes that the first locomotives will use standard tested compon-

(Continued on page 9)

TIME SAVING IDEAS FOR SEPTEMBER

MOTIVE POWER AND CAR

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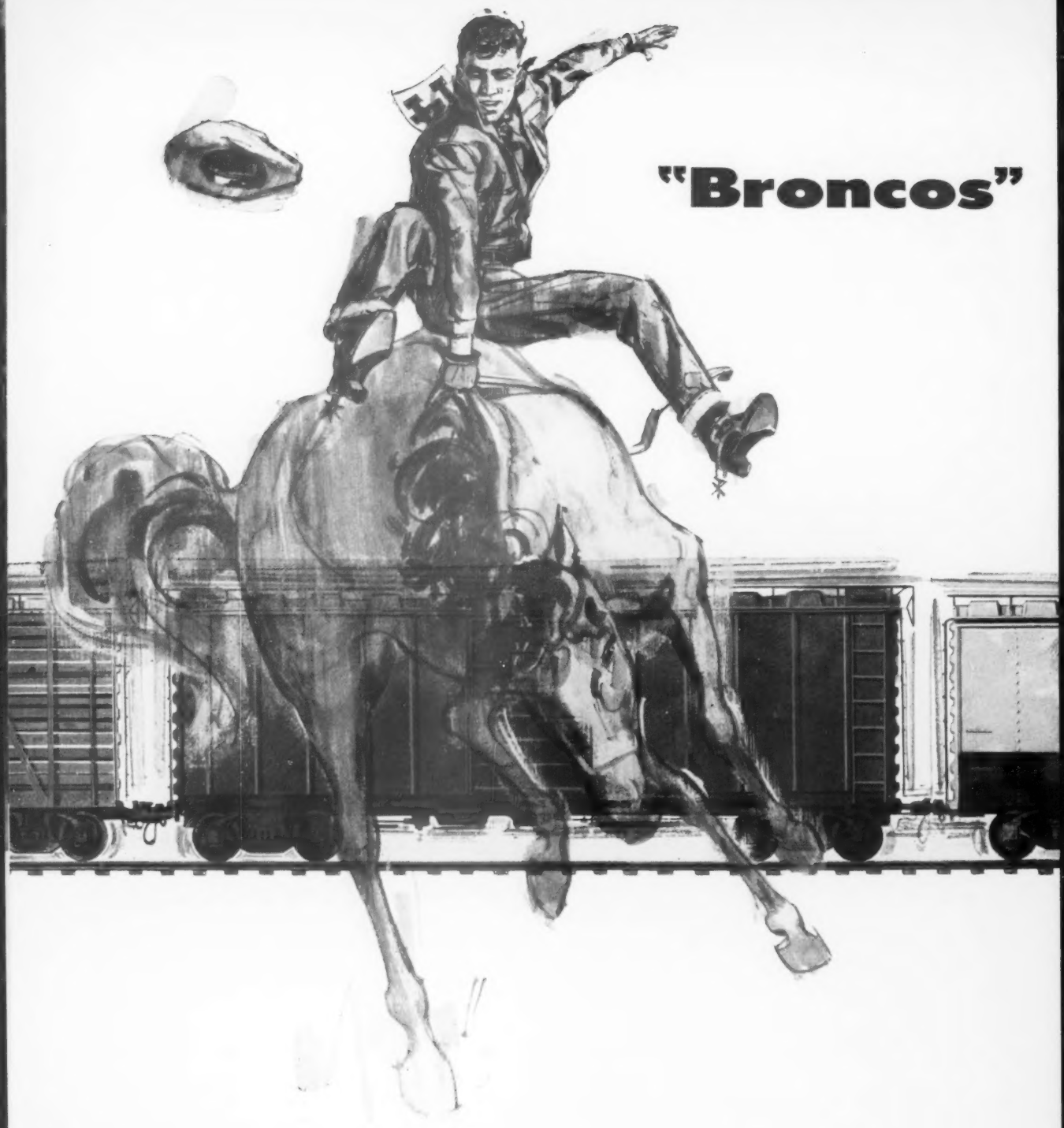
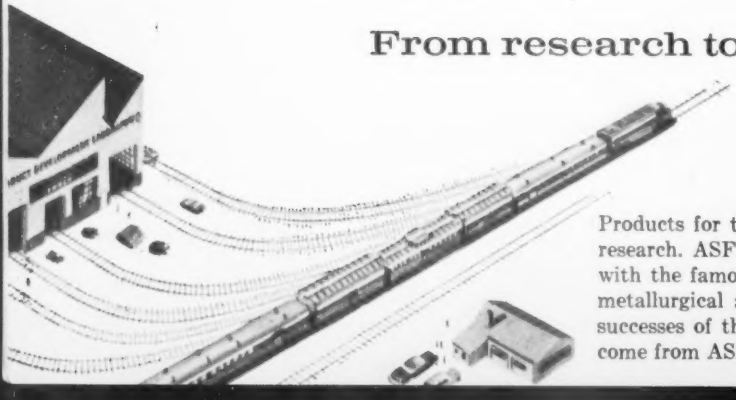


From research to reality

in railroad progress



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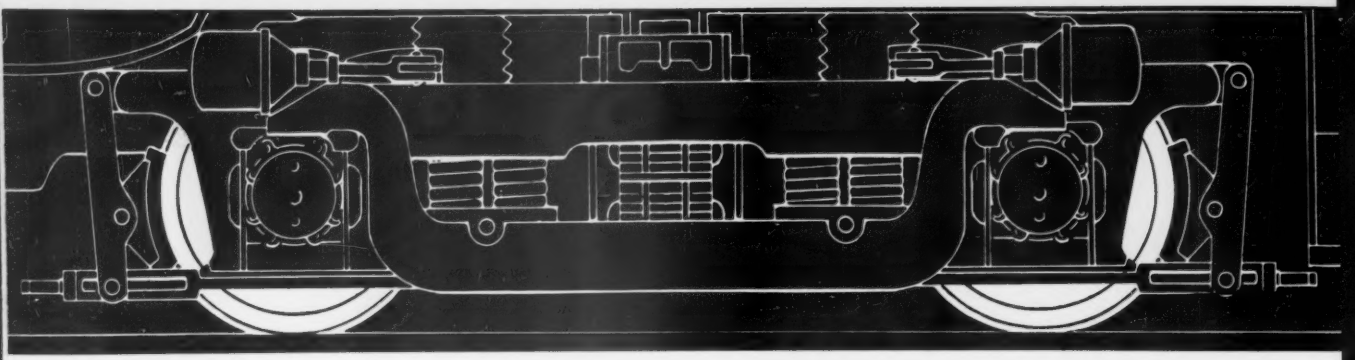
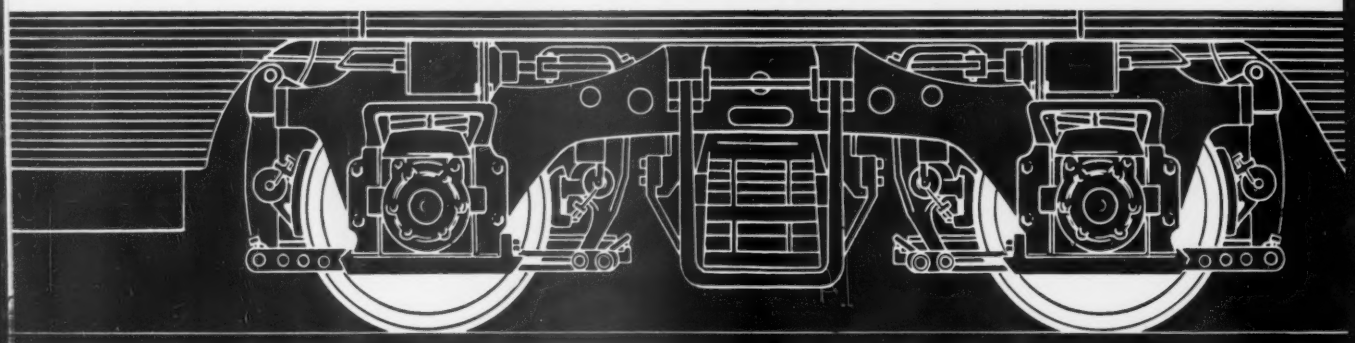
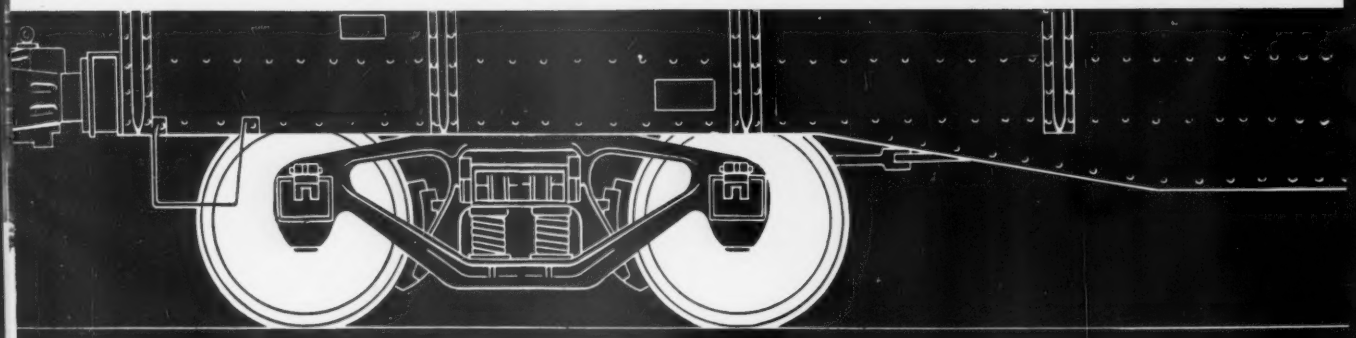


DIESEL . . .



PASSENGER . . .



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Coordinated Mechanical Associations Program

Hotel Sherman, Chicago
September 12, 13 and 14

Air Brake Association

MONDAY, SEPTEMBER 12

10 a.m.

President's address.
Address—E. F. Tuck, chief mechanical officer, St. Louis — San Francisco.
Condemming Gages for the D-22-A and D-24 Control Valves and Universal Valves—Pittsburgh Air Brake Club.
Development of a Superior Brake Cylinder Lubricant — Montreal Air Brake Club.

2 p.m.

Technique in the Use of Composition Shoes—C. M. Cabble, Jr., senior staff engineer, Westinghouse Air Brake Co.
Automation of Air Brake Testing —P. M. Brath, staff engineer, Westinghouse Air Brake Co.
Pressure Maintaining Feature of Braking — George Ferguson, air-brake supervisor, Pennsylvania.
6-N.R. Type Distributing Valves— —Donald E. Whitney, general air-brake supervisor, Great Northern.

TUESDAY, SEPTEMBER 13

9 a.m.

Fundamentals of Pneumatic Brake Calibration — H. N. Sudduth, chief engineer railway and pneumatic equipment, New York Air Brake Co.
No. 26-L Equipment Devices and Their Operation — St. Louis Air Brake Club.
No. 26-F Car Brake Equipment, Its Operation and Maintenance — Central Air Brake Club.
Multiple Uniting of 26-L, 24-RL and No 6 Type Equipments—Manhattan Air Brake Club.

2 p.m.

Electro-Motive Division, GM, tour.

WEDNESDAY, SEPTEMBER 14

9 a.m.

My Experience with 24-RL Brakes on Locomotives—Harold Rausch, air-brake foreman, St. Louis—San Francisco.
Elections.
Question Box.
Committee reports.

P. M. Shoemaker, president of the Lackawanna, will be the speaker at the C.M.A. luncheon honoring railroad presidents on Tuesday, Sept. 13.

Car Department Officers' Association

MONDAY, SEPTEMBER 12

10 a.m.

President's address.
Report—Committee on AAR Loading Rules.
Address—M. G. McInnes, executive vice-president, Erie.

2 p.m.

Report — Committee on Design, Maintenance and Upgrading Freight-Car Equipment.
Report—Committee on Interchange and Billing for Car Repairs.

TUESDAY, SEPTEMBER 13

9 a.m.

Report—Committee on Rail-Road Transportation.
Address—E. C. R. Lasher, president, North American Car Corp.
Report—Committee on Light Repair Tracks and Train Yard Operation.

2 p.m.

Report—Committee on Car Lubrication.
Comments — W. M. Keller, vice-president (research), AAR.
Report — Committee on Wheels, Axles and Wheel Shop Practices.

WEDNESDAY, SEPTEMBER 14

9 a.m.

Report—Committee on Passenger Car Maintenance, including Air Conditioning and Heating.
Report — Committee on Maintenance and Servicing Refrigerator Cars.
Report—Committee on Painting.
Miscellaneous reports.
Election of Officers.

Locomotive Maintenance Officers' Association

MONDAY, SEPTEMBER 12

10 a.m.

President's address.
Address—F. B. Rykoskey, general superintendent motive power and equipment, Baltimore & Ohio.
Fuel and Lube Oil. Topic: Relation of fuel and lube oil to diesel engine performance.

2 p.m.

Steam Generator and Water Treatment. Topic: Relation of controls to steam generator performance.
Diesel-Electrical Maintenance. Topic: Maintenance of control equipment to prevent road delays.

TUESDAY, SEPTEMBER 13

8:30 a.m.

Diesel Engine Maintenance. Topic: Upgrading diesel engines for extended economical service life.
Address—P. F. Pfahler, assistant director, Bureau Safety & Service, ICC.
Diesel Mechanical — Other. Topic: Problems of truck and related parts maintenance.

2:30 p.m.

Tours of AAR Laboratory and plant of Electro-Motive Division, GM.

WEDNESDAY, SEPTEMBER 14

8:30 a.m.

Shop Equipment. Topic: Equipment for efficient engine rebuilding.
Diesel Material Reconditioning and Control. Topic: New techniques in reclamation of diesel locomotive parts.

1:30 p.m.

New Developments in Motive Power Maintenance. Topic: New developments in motive power.

Railway Fuel and Operating Officers' Association

MONDAY, SEPTEMBER 12

10 a.m.

President's address.
Transportation — J. C. Grissom, vice-president and general manager, Louisville & Nashville.
Report of secretary.
Safety on the Railroad — H. C. Ekstam, supervisor of safety, New York Central.
Compliance with Signal Rules—L. S. Randolph, supervisor locomotive performance, New York Central.

2 p.m.

Panel discussion — Evolution of Train Handling.
Report on Economy in Use of Fuel Oil.

TUESDAY, SEPTEMBER 13

9 a.m.

Public Relations—S. C. Scholl, director personnel, Louisville & Nashville.
Report on Train Line and Air System Defrosting.
Panel Report—Freight Loss and Damage Prevention.
Benefits and Economy of Automatic Independent Sanding—A. H. Glass, chief power and fuel supervisor, Chesapeake & Ohio.
Report on Economical Utilization of Power.

2 p.m.

Comparison between Electric and Diesel Locomotives—W. P. Primm, road foreman of engines, Pennsylvania.
Importance of Handling Traffic—Railroad and shipper speaker.
Advance Horsepower on Diesel Locomotives — N. J. Hochanadel, electrical engineer, Alco Products, Inc.
Panel Discussion — Instructions and Demonstration of Air-Brake Handling to the Engineer by Road Foreman.

WEDNESDAY, SEPTEMBER 14

9 a.m.

Panel discussion—Diesel Failures —Causes and Remedies
Official business and open forum.

'Dark Horse' Diesel

(Continued from page 5)

ents as much as possible. The units will operate at low speed (40 mph maximum), relatively low horsepower, and will use standard external and running-gear design.

The Indian engineer also points out that his transmission development is experimental, and while he is confident that the basic principles are applicable to high-horsepower locomotives, tests with the smaller units will determine future development.

The new transmission, Mr. Suri contends, holds promise in a country such as India which must import most of its diesel fuel. This, plus the parallel need to conserve foreign-exchange reserves, is why the inherent efficiency of a mechanical transmission is worth developing.

U.S. Team Reports on Tour of USSR

The eight-man team of U.S. railroad officers (RL&C, July 1960, page 8) who, under an exchange program signed last fall between the U.S. and Russia, arrived in Moscow on May 30, have returned to the U.S. after a seven week, 6,500-mile inspection trip of

(Continued on page 12)

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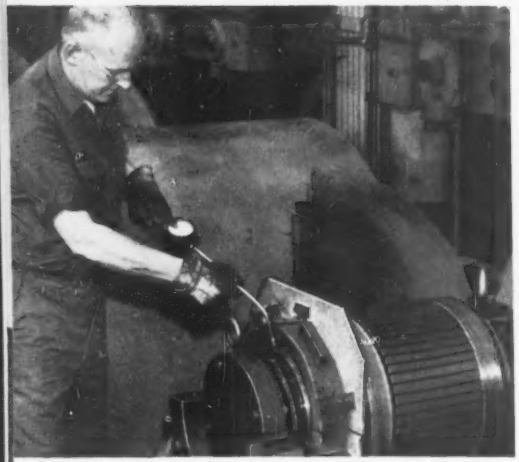

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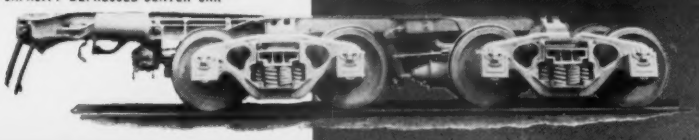

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(Continued from page 9)

Russian and West European railroads. The trip was sponsored by the AAR and arranged through the State Department. At a press conference upon their return, the group, headed by C. D. Buford, AAR vice-president, who served as spokesman, reported briefly on their observations as follows.

Rolling Stock—Exact size of the Soviet freight car fleet is unknown. That information is considered "classified."

They still operate a lot of two-axle cars, but they're working to replace these with larger four-axle and six-axle units. In the trains we saw, about 50 to 60 per cent of the cars were four-axle; they claim, however, that they're about 70 per cent equipped with these bigger cars.

With the possible exception of West Germany, Russia seems to be the only European country going to larger cars. But what the Russians want is capacity. They're also switching to the automatic coupler. Outside buffers, which are standard in the rest of Europe are coming off, though they still have many of them now. Their standard coupler is very close to U.S. design, a slightly modified Willison.

They have almost no specialized equipment as we know it. Everything is handled in standard cars. They've gone a long way toward standardization. They have boxes, gons, flats, hoppers, tanks and reefers in their car fleet. Their new 90-ton hopper and their latest design tank car are first class.

Maintenance seems to be pretty good, on the whole. Trucks and running gear on the 4-axle cars are well maintained. We noticed some car bodies that were in poor condition, however. They do have hotboxes, too; we saw six setouts in one yard. They have roller-bearing cars, but not many. Their plan is to have all other cars equipped with pads by the end of this year. They talk of having all roller-bearing cars by 1965, but it's hard to see how they will make that.

Their newest box car is largely wood: a combination of wood and steel. And they're working on mechanical refrigeration. One idea they have now is a 26-car integrated setup, with a power car and coolant circulating in a single piping system through 25.

Passenger equipment is considerably behind U.S. We saw no air conditioning anywhere. We traveled in an 8-room car, two per room, with each two rooms sharing a washstand. Toilet facilities are at the end of the car. Seats were upholstered, but springs were rather hard. And this equipment, we were told, is what they call their "soft transportation." Passenger cars are equipped with individual heating plants.

Trains operate at only moderate speeds generally. Passenger trains, for example, average around 27 mph.

We checked into the report of the remote-controlled train experiment the Russians have talked about. We were told the train is "temporarily under repair." Automation in Russia is the use of any kind of machine, a somewhat different view from the U.S.

Motive Power—They still use a lot of steam, but they're electrifying lines in a good many places and, of course, they are installing diesel-electrics in a big way. They introduced a new 3,000-hp diesel while we were over there.

They've apparently dropped the idea of an atomic locomotive. Now the idea is to use atomic power to generate electricity in substations and electrify. They're a long way down the path of modernizing their motive power already. Where steam is still used, it's being converted from coal to oil.

The catenary structure they use is very light weight; we didn't think it was adequate for heavy tonnage. But their average train seems to run 50 to 60 cars, and at low speed compared with ours. So the catenary is all right, apparently. Certainly it does reduce the capital required.

Safety—This is a very important subject on USSR railroads—with a slight twist from U.S. practice. Their approach is keyed to the fundamental safety of train operation—what we consider rudimentary. It is their approach to individual safety that differs. They don't seem too concerned. They permit passengers to ride on top of trains, even in electrified territory with catenary, and through tunnels. We saw no safety goggles at all—even on workmen pouring babbitt and working at lathes. And you see employees crawl under cars; things are common which we don't allow on U.S. railroads at all.

Interest in U.S.—Most Russian railroaders are greatly interested in U.S. practices, and read all they can get about them. Articles and books on U.S. developments are translated and widely circulated. Right now, they want to learn all about piggybacking, which they are considering but have not yet initiated, and mergers. All our current merger stories are being read carefully over there. As it turns out, they're interested because they may discover ways to produce savings by merging some of their regions. They have 35, and they recently merged three into one in the Moscow area. Each of the 35 regions has a separate name and is a separate operating entity.

When they merge regions the main thing they do is eliminate a layer of management. It further centralizes the administration, which seems consistent with their overall approach.

A lot of Russian industry has been decentralized in recent years but not railroads. They continue to be headed by the Minister of Railroad Transport who reports to the Department of Transportation and Communications.

Orders and Inquiries for New Equipment

Placed since Closing of August Issue

Freight-Car Orders

ATLANTIC COAST LINE. *Pullman-Standard:* 50 90-ton jumbo type covered hoppers. Delivered in August. Cost, approximately $750,000.

CANADIAN NATIONAL. *Eastern Car Div., Dominion Steel Corp.:* 80 40-ft narrow gage flat cars. Will have 35 per cent increased capacity because of use of low-alloy steel instead of carbon structural steel.

NORTH AMERICAN CAR. *Pacific Car & Fdry.:* 100 50-ft 70-ton meat refrigerator cars (50 to be equipped with damage-free loading devices). *Company shops:* 26 70-ton 10,000-gal sodium chlorate tank, and 150 40-ft 50-ton meat refrigerator cars.

SOO LINE. *Pullman-Standard:* 5 85-ft piggyback flat. For delivery within near future.

Notes and Inquiries

Louisville & Nashville will rebuild 3,000 50-ton hopper cars at a cost of approximately $10,000,000. Prefabricated sides, ends, and floors will be used.

New York City Transit Authority will seek $135,473,000 for capital expenditures during 1961, approximately $23,000,000 less than budgeted for 1960. Proposed expenditures include $38,000,000 for purchase of 300 cars for IRT and BMT main lines, and mechanical upgrading 300 IND cars; and $9,600,000 for purchase of 80 new cars for Flushing IRT line.

Pennsylvania. The first of 66 electric freight locomotives ordered last year (RL&C, October, 1959, page 7) is scheduled to go into service on the Pennsylvania in October, hauling fast through freight trains on the electrified lines east of Harrisburg, Pa. The 4,400-hp locomotive will be followed by the other 65 units at the rate of about two a month beginning in November. "The newly designed locomotives will employ the modern rectifier method of transforming alternating current, which is more efficiently transmitted by wire, into direct current, which is more efficiently used by the traction motors to power the wheels," James P. Newell vice president, operations, has said. The Pennsylvania is engaged in a rehabilitation and heavy repair program, producing 54 cars each working day for the remainder of 1960. Each day's production includes 24 box cars, 15 hoppers, and 15 gondolas.

Roller-Bearing Inspection Following Derailments

The AAR Mechanical Division has issued the following instructions with regard to damage to roller bearings in derailments: "When cars equipped with journal roller bearings are involved in derailments, a very careful examination, preferably by dismantling at a wheel shop, should be made of all of the roller-bearing assemblies before cars are permitted to return to service.

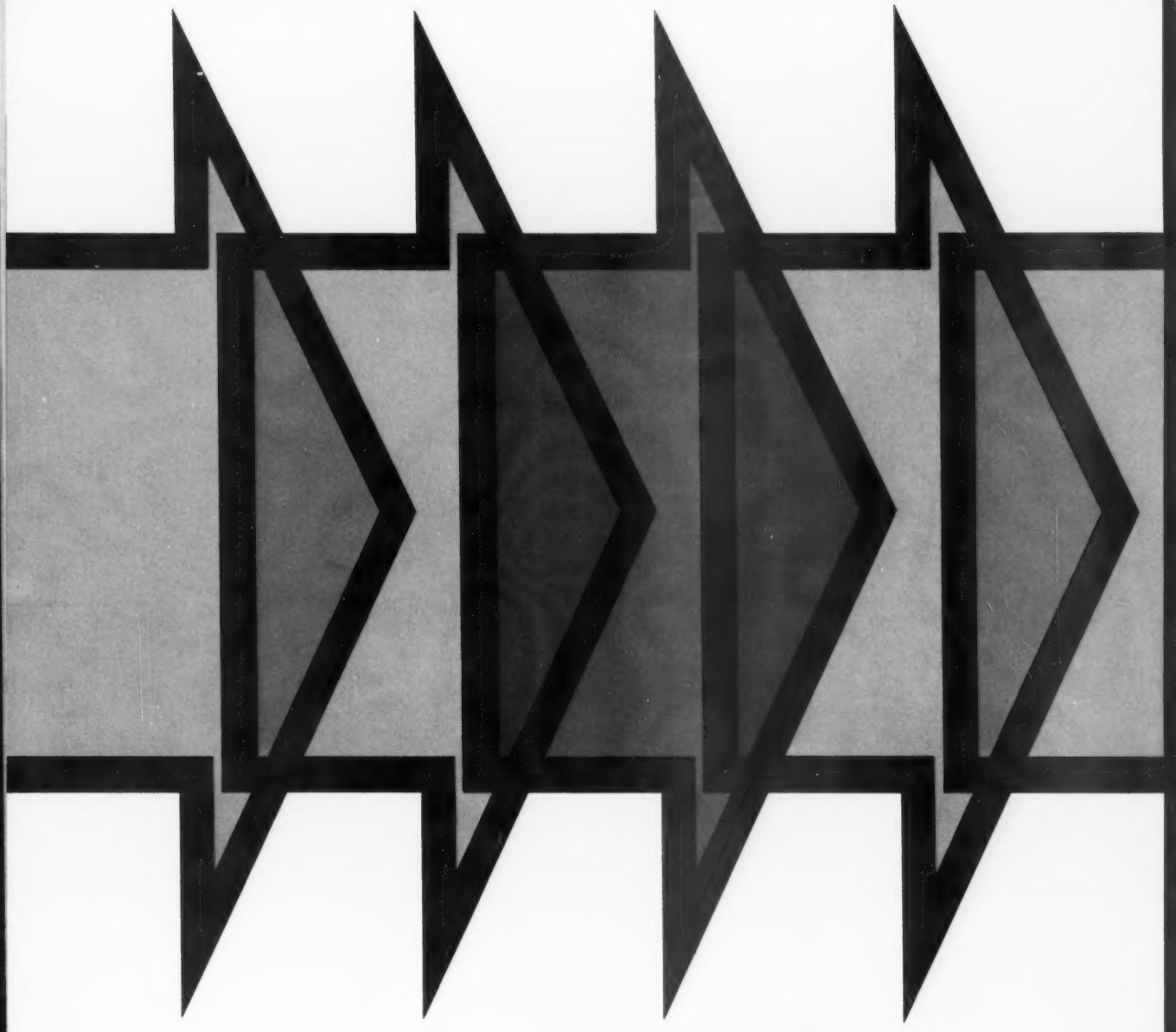
"In derailments in the past, it has been found that some of the roller bearings were Brinelled and damaged in such a way that continued operation would have resulted in overheated assemblies, and it is, therefore, important that journal roller bearings having such defects be removed from service immediately.

"In cases where there is any doubt as to whether bearing should be returned to service or not, manufacturer should be consulted."

Lubricators Outperform Loose Waste

With over half of the U.S. and Canadian freight-car fleet equipped with journal lubricating devices, latest figures from the AAR Mechanical Division indicate that only 18 per cent of the hot boxes occurred on these cars. Since January 1, 1960, railroads have been supplying the Mechanical Division with hot-box statistics broken down between waste-equipped and pad-equipped cars. While performance in April 1960 was poorer than the comparable month in the preceding five years, the new style of reporting indicates that this was not the fault of the lubricators. Monthly figures are given below.

	Cars set off between terminals with hot boxes, total		Miles per car set off
April 1955	9,956		280,002
April 1956	10,083		290,626
April 1957	12,396		228,493
April 1958	9,295		264,093
April 1959	11,219		243,032
	Pads	Waste	
Jan. 1960	2,329	5,887	324,954
Feb. 1960	2,261	5,549	323,155
March 1960	2,566	7,429	274,195
April 1960	1,900	10,296	223,494



FROM GREAT LAKES STEEL

15 X-A-R 30

ABRASION RESISTANT STEELS

TWO NEW STEELS—HARDER FOR HARDER JOBS

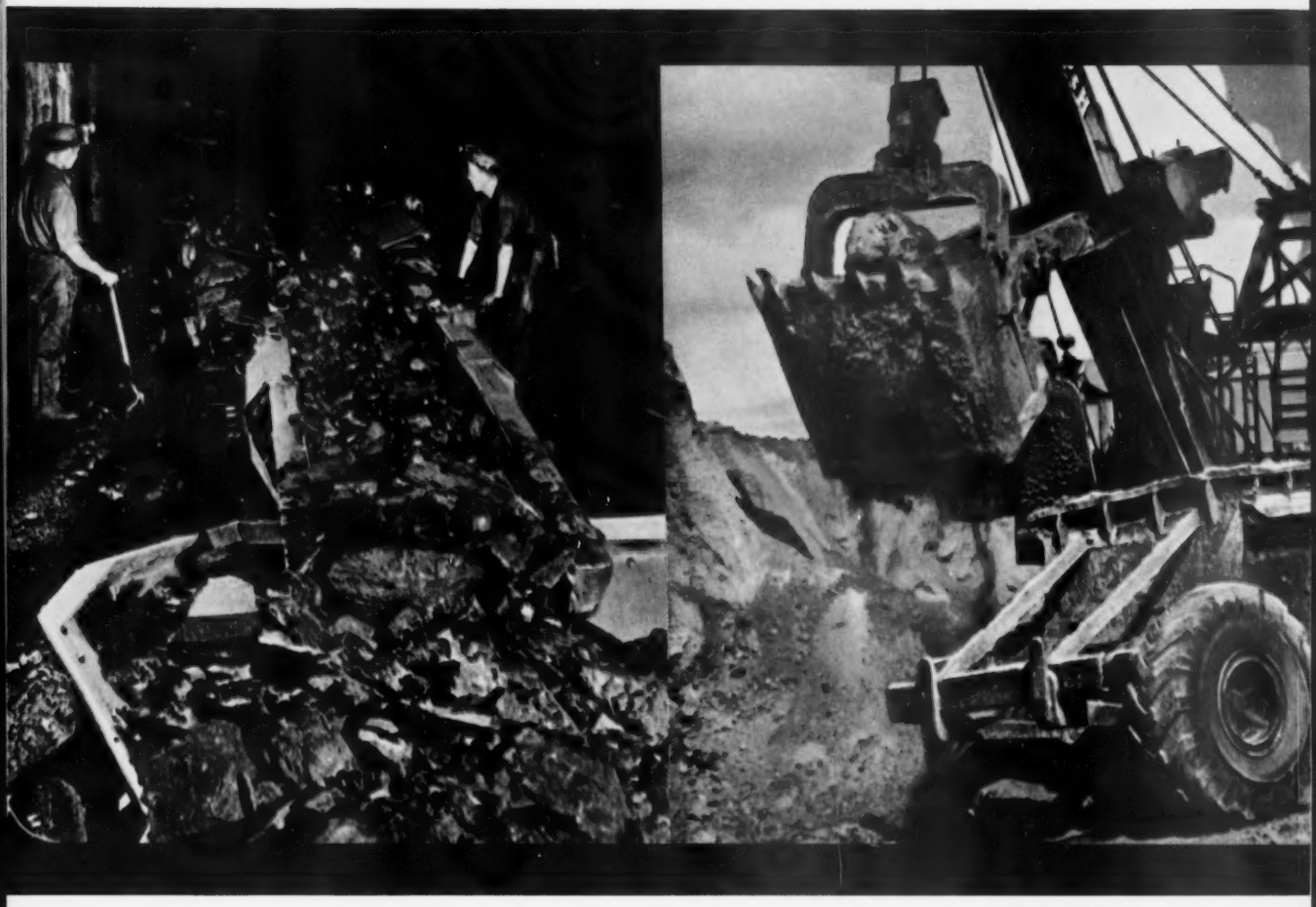
X-A-R

ABRASION RESISTANT STEELS

HARD ENOUGH AND TOUGH ENOUGH TO LAST

Is abrasion your constant enemy? If your equipment meets materials as they're scooped, shoved, slid, pushed, dragged or dumped, does it face the recurring threat of downtime for repairs or replacement? To eliminate such maintenance headaches, Great Lakes Steel has developed two tougher, harder alloy steels—X-A-R 15 and X-A-R 30. They're supplied in hardnesses from 360 to 400 BHN (or, by agreement, in a range of hardness between 265 and 500 Brinell). And they're especially effective and economical in those critical bear-the-brunt areas of the equipment where wear is worst—liners, teeth, bars, blades and plates, for example. *Under conditions that commonly wear out equipment in a hurry, X-A-R abrasion-resistant steels outwear any other type of steel.*

Great Lakes Steel is a division of



WHERE MATERIALS COLLIDE WITH EQUIPMENT

Chemical composition alone is not the secret of low carbon X-A-R steels; their balanced combination of uniformity, high strength, hardness and toughness is the result of close control during heat-treating, quenching and tempering. This makes them more workable, too. Under normal welding and fabricating conditions use X-A-R 30. For *extremely* difficult problems, such as welding under cold conditions or extensive flame cutting, choose X-A-R 15.

X-A-R abrasion resistant steels are immediately available in ⅛″ to 1″ thicknesses, widths up to 72″ and lengths up to 35′. For technical information and supply sources, see next page.

X-A-R

A PRODUCT OF

GREAT LAKES STEEL

Detroit 29, Michigan

NATIONAL STEEL CORPORATION

15 X-A-R 30

TECHNICAL INFORMATION

CHEMICAL COMPOSITION

X-A-R steels are furnished at two specified carbon ranges. These are 14 to 20 carbon for X-A-R 15 and 25 to 30 carbon for X-A-R 30. The balance of the typical composition is:

Manganese	.80%	Chromium	.65
Phosphorous	.020	Molybdenum	.20
Sulphur	.028	Zirconium	.06
Silicon	.60		

TYPICAL MECHANICAL PROPERTIES

	At Brinell Hardnesses of: 363	400
Tensile Strength, psi	180,000	200,000
Yield Strength, psi	165,000	180,000
% Elongation in 2"*	17	16
% Reduction in Area*	56	55
Charpy V Impact at —75°F.	12 (Ft. Lbs.)	7

*Based on standard .505" specimen

ENGINEERING DATA

Resistance to Atmospheric Corrosion (Rural, Marine, and Industrial Environments)	3-5 times copper-bearing or carbon constructional steel
Compressive Yield Strength, psi	Approx. equal to Tensile Yield Strength
Ultimate Shearing Strength, psi	Approx. equal to Tensile Yield Strength
Modulus of Elasticity, psi	29/30,000,000
Endurance Limit (rotating beam)	60% of Tensile Strength
Coefficient of Expansion per °F.	70°F. to 200°F.—.0000062

FABRICATION

Cold Bend Test: Moderate bending can be performed within the usual range of hardnesses. For free bending, it is recommended that a mandrel be used not less than ten times the thickness of the metal through an angle of 90°.

Welding: Low hydrogen electrodes are recommended for welding X-A-R steels. The grade of electrode used is dependent on the strength requirement of the weldment.

Burning: X-A-R steels can be flame cut without pre-heating or stress relieving after cutting.

COMPLETE METALLURGICAL SERVICE

In addition to the information given in this folder, there is a great deal of detailed data available to steel users covering all characteristics of X-A-R steels. Furthermore, a thoroughly competent metallurgical service organization is available to work with you on any application problem you may have.

X-A-R STEELS ARE AVAILABLE AT THESE STEEL SERVICE CENTERS

BENEDICT-MILLER
Lyndhurst, New Jersey

JOSEPH DEMSEY COMPANY
Cleveland, Ohio

DUCOMMUN METALS & SUPPLY COMPANY
Los Angeles, California

INTERSTATE STEEL COMPANY
Evanston, Illinois

LOCKHART IRON & STEEL COMPANY
Pittsburgh, Pennsylvania

MARSH STEEL & ALUMINUM COMPANY
Kansas City, Missouri

O'NEAL STEEL, INCORPORATED
Birmingham, Alabama

SALT LAKE HARDWARE COMPANY
Salt Lake City, Utah

A. C. LESLIE & COMPANY, LIMITED
Montreal, Canada

15 X-A-R 30
ABRASION RESISTANT STEELS

Steel-Reinforced Bulkhead

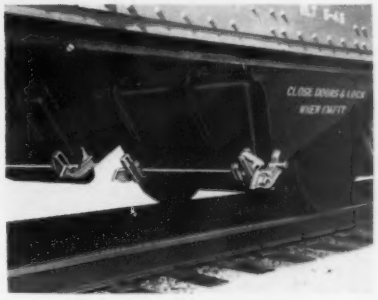
The Signode steel-reinforced bulkhead uses the weight of loads like potash, bulk clay, rock salt, fertilizers, and roof granules to press the extended sides of flexible bulkheads tight against car walls and restrain load movement. Their flexibility allows them to "roll with the punch" of in-transit impacts.

The leak-proof bulkheads are installed in less time than required for wooden bulkheading. A pair weighs only 70 lb, about one-sixth as much as the lumber needed for a similar job. Lading is retained in the ends of the car when the car is opened, allowing access with mechanical unloading equipment. Opening the load involves only cutting the bulkhead, bottom to top, and tacking cut ends to the car walls.

Floor flaps, 6 and 8 in. deep respectively, extend under part of the load to increase holding power and guard against leaks. Fifteen ¾-in. x .020-in. steel straps are laminated between two plies of 150-lb kraft heavy duty linerboard in a 6-ft model; a 4-ft model has 11. *Signode Steel Strapping Co., Dept. RLC, 2600 N. Western ave., Chicago 47.*

Sand Valve Nozzle

A sand valve nozzle, of flexible rubber, is easily and quickly installed on locomotives and secured in place with a simple pipe clamp. The nozzle always remains closed until the sand-control valve is opened. With the application of sand, the nozzle opens instantly and automatically. Being made of rubber, it won't clog or freeze up. The product is available in lengths of 50 ft, 1 in. in diameter. *Railroad Rubber Products Inc., Dept RLC, Ashtabula, Ohio.*



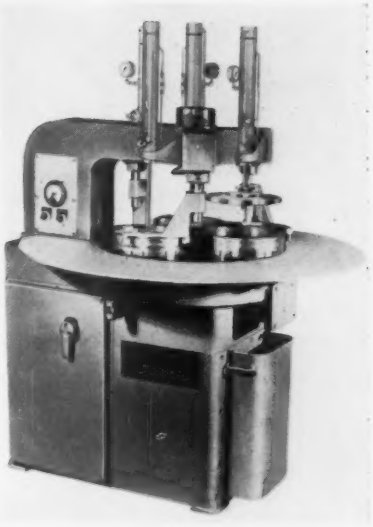
Dual Toggle Lock For Hopper Cars

A dual toggle lock that can be applied to any new or existing open-top hopper car is said to be positive locking. It is supplied as an assembled unit and is operated, with safety and with little effort, from side of hopper. Fewer man-hours are required for its application. *Enterprise Railway Equipment Co., Dept. RLC, 59 East Van Buren st., Chicago 5.*

Insulation Test Sets

The new D-C Hypot Jr. series weighs only 20 lb and operates from 110 volt a-c. The test sets provide insulation leakage and breakdown tests for maintenance, repair, and "proof" testing of electrical equipment, such as cables, bushings, transformers, motors and generators. Three models are available, with output continuously variable from 0-1500, 0-2500, and 0-5000 volts d-c. Output current of 2 ma is had at full voltage and limited to 15 ma on short circuit, thus protecting equipment from overload. Operation is from 110 volts 50/60 cycle a-c with a selenium rectifier power supply for high voltage.

The "breakdown" light indicates arcing, corona, or insulation breakdown, while a second light indicates when the insulation leakage current exceeds a pre-determined maximum, adjustable from 300 microamperes to 3 milliamperes. *Associated Research, Inc., Dept. RLC, 3777 W. Belmont ave., Chicago 18.*



Lapping Machine

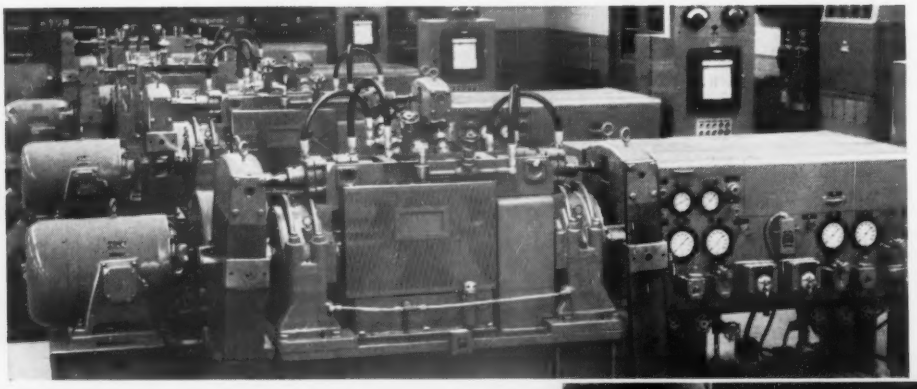
The Model 24 Lapmaster is a redesigned 24-in. machine. It is more compact, but has a large wrap-around adjustable work table for loading and unloading parts from almost any position. Parts of almost any shape or material can be lapped on a production basis within tolerances of one light band or less and uniform microinch finishes of 2 to 3 RMS.

A new abrasive distribution system provides adjustable flow control and, through pressure pumping at a constant head, assures uniform deposit at the lapping stations. Pump and tank are mounted on the inside of a door in the machine base. Pneumatic lifts speed up loading and unloading of small and medium parts. A single hand wheel permits easy adjustment of conditioning rings.

Another Model 24, an open-face type, incorporates the same design features except for penumatic lifts. *Crane Packing Co., Dept. RLC, 6400 Oakton st., Morton Grove, Ill.*

(Turn to page 77)

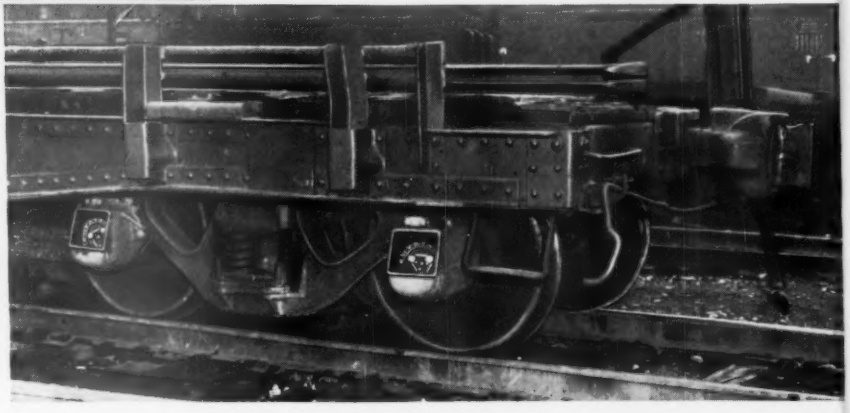
HYATT spearheads the 60's with a NEW TAPER designed for top speeds



Here in the Hyatt lab, hundreds of the new taper freight bearings proved their ability to perform satisfactorily under excessive radial and thrust loads, at speeds beyond any they'll encounter in actual service.

At final assembly, the assembled lateral clearance of every bearing is carefully checked. This operation guarantees that the bearing will have exactly the right amount of clearance when it is pressed on to your journal.

Above: Each part of a Hyatt taper freight bearing is 100% inspected by ultra modern indicating gauges and rechecked to tolerances measured in ten thousandths of an inch.



Right: A new Hyatt taper freight bearing installed in a converted integral box side frame being used in piggy back service. It can be installed interchangeably with other freight car roller bearings.

FREIGHT BEARING

on the long haul!

Designed for the speeds of tomorrow, Hyatt's new taper freight bearing incorporates the most successful features of taper roller bearings, thoroughly proved seal and other forward-looking refinements. Results: Hyatt taper freight bearings are proving themselves by averaging 10,000 trouble-free miles a month on hundreds of hard working, high-speed cars. A.R.R. approved, Hyatt taper freight bearings are already in production in the 5½ x 10, 6 x 11, and 6½ x 12 journal sizes. Specify Hyatt taper freight bearings. See if they don't out perform any journal bearing you've ever used!

HYATT BEARINGS DIVISION
GENERAL MOTORS CORPORATION,
HARRISON, NEW JERSEY

HYATT ***HY-ROLL BEARINGS***
FOR NON-STOP FREIGHT

CPS RES-I-GLAS®

GLASS BANDING TAPE

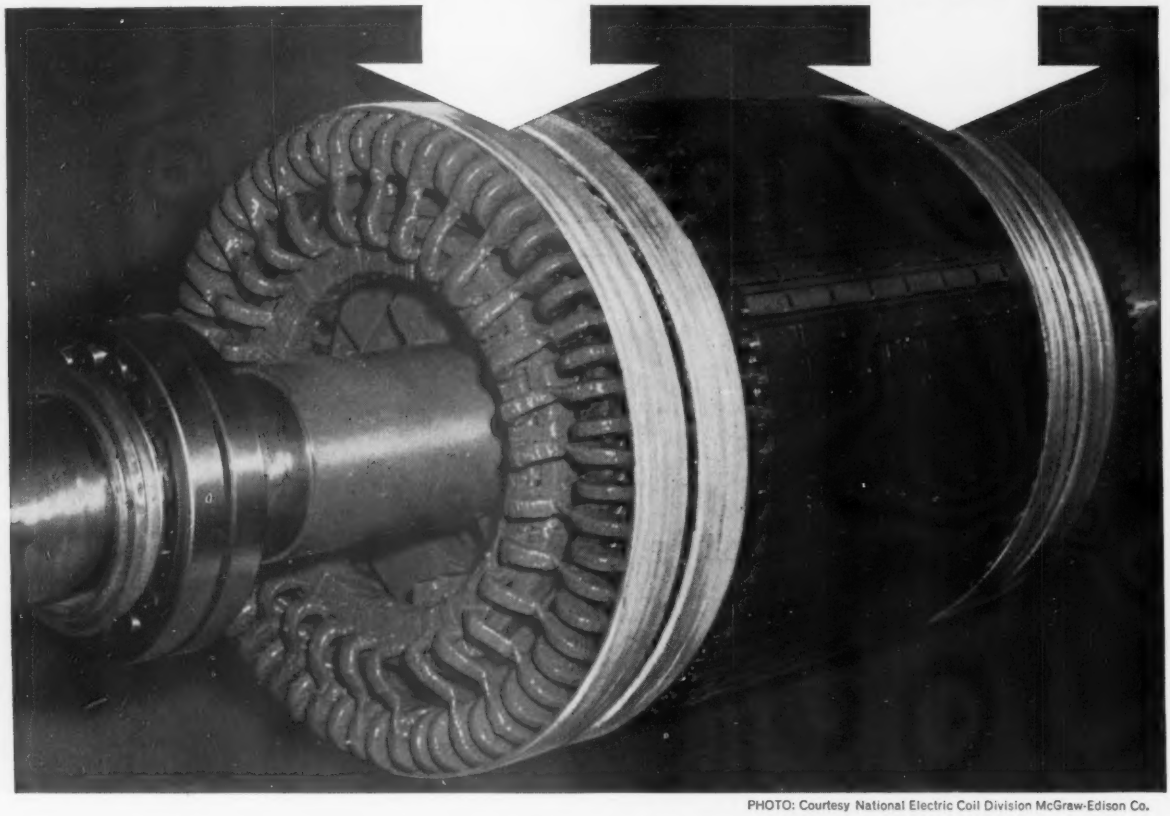


PHOTO: Courtesy National Electric Coil Division McGraw-Edison Co.

- For Proven, Dependable Bands
- Superior Performance
- In use for four years in most major shops
- Lower Cost

RES-I-GLAS® DISTRIBUTORS

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San Francisco 10, Calif.

Earl B. Beach Co. (and branches)
Box 8623, Verona Road
Pittsburgh 21, Pennsylvania

Electrical Insulation Suppliers, Inc.
500 Means St., N. W.
Atlanta, Georgia

The Huse-Liberty Mica Co.
Peabody Industrial Center
Lynnfield St., Peabody, Massachusetts

Insulation Manufacturers Corp.
(and branches—and authorized IMC representatives)
565 W. Washington Blvd.
Chicago 6, Illinois

C. D. La Moree (and branches)
2433 Birkdale St.
Los Angeles 31, California

Robert McKeown Co., Inc.
99 Dorsa Ave.
Livingston, New Jersey

National Electric Coil Co.
(and branches)
800 King Ave., Columbus, Ohio

C. E. Riggs, Inc.
422 N. W. 8th Ave., Portland, Oregon

Southern Electric Co.
5025 Columbia Ave., Hammond, Indiana

Summers Electric Co., Inc.
1502 S. Good-Latimer Expressway
Dallas 10, Texas

White Supply Co.
4343-47 Duncan Ave.
St. Louis 10, Missouri

CANADA

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St. Laurent, Quebec, Canada

H. P. Ruggles Company, Ltd.
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Box 62, Hamilton, Ontario, Canada

CHICAGO PRINTED STRING COMPANY

INDUSTRIAL DIVISION

2300 LOGAN BLVD., CHICAGO 47, ILLINOIS

MANUFACTURED IN CANADA BY RIBBON FABRICS, INC., RIVIERE DES PRAIRIES, QUEBEC

EDITORIALS

Attend All Meetings

The September mechanical meetings at Chicago are worthwhile. They have value to the men *in attendance* because the meetings report on and discuss the latest and best methods and equipment used in obtaining peak efficiency in maintenance and repair operations. They have value to each railroad because the information exchanged at these meetings will help each railroad improve its car and locomotive performance.

Emphasis is placed on "inattendance." It is essential that every man permitted to go to these meetings be physically present when each session starts. We mean by "present" to be at each session from start to finish. This matter of attendance is vitally important. It is an obligation that each man assumes when he is sent to the meetings to represent his railroad.

More than an obligation, however, is the fact that a man's absence from the meetings represents a distinct loss, both to himself and the railroad industry. Unless he gets something out of the meetings he is wasting his time. His railroad suffers in a two-fold way. It could have used his time productively on the job and saved the cost of the trip. It will not benefit from the up-to-date valuable information made available at the Coordinated Mechanical meetings.

The wonderful opportunities these meetings afford should not be missed. It is a privilege to attend them.

Mergers and Motive Power

Editorial comment published in our last issue has raised several questions which we are supposed to answer. Why, we are asked, when we endorse fourth dimensional thinking, don't we do some of it? Why do we assure our readers that the railroads will buy more diesels, and in the same issue publish the report of Committee 13, Railroad Electrification, which lists all the advantages of electric operation? Why, when the railroads want bigger motive power, don't they use electric units which can be made big and fast enough to pull the knuckles out of any drawgear and go faster than anyone can afford to run? If maintenance costs of electric locomotives are so low, why don't we use them?

Basically, the trouble stems from the fact that we have a whole lot of what, for our country, are little railroads, in competition with each other. This situation is complicated by the fact that the railroads, while competing with each other, must also meet subsidized competition. We all like to drive our own automobiles, so we endorse the building of highways that are subsidized roadbeds for railroad competition. The airways must be policed, and supplied with services at government expense since there is no other way to do it, and air transport must be developed for our very preservation. The railroads are the backbone of our transportation and must receive consideration.

What then can we do to enjoy the advantages of electrification? The first hurdle is to find the money to pay for an installation. Electrification cannot be purchased piecemeal, but must be planned to include a sizeable section of railroad. The traffic on this section of railroad must be heavy enough and profitable enough to pay for the initial investment in a reasonable period. In their current impoverished condition, few railroads could raise the money necessary to initiate electric operation. Also, since there are apparently too many, there are few sections of railroads with sufficiently heavy traffic sections which are long enough to warrant the necessary investment for complete electrification. There has been technical progress during a rather unpromising period.

Conditions, however, are changing in that railroad managements are realizing the advantages of consolidation. They have also disposed of many of their branch lines. Heavier concentrations of traffic will become possible as more mergers are effected. New systems and new equipment developed recently, such as 25,000-volt, 60-cycle power supply and rectifier locomotives which can be made out of diesels, are making electric operation increasingly attractive. It seems to be only a matter of time before there will be new installations in this country. So all credit to the rugged few who continue the work of Committee 13 and keep the railroads up to date with the progress of railroad electrification. They are doing some real fourth-dimensional thinking.

Money's Worth

Recent figures seem to indicate that the mandatory journal lubricator program for interchange freight cars is paying off. Examination of the hot box figures on page 12, this issue, makes it evident that these devices will make possible a drastic reduction in the number of hot boxes when all cars are equipped. Last April there were 1,900 hot boxes on pad-equipped cars and 10,296 hot boxes on waste-packed cars—this at a time when more than half of the American car fleet already had lubricators.

Over the objections of some individual railroads and despite the shortcomings of some lubricator designs, this program has now advanced to a state where a rather sizeable investment is beginning to show handsome returns nationally. Research by the AAR and the work of the Lubrication Committee of the AAR Mechanical Division have produced an economical arrangement for lubrication of the solid journal bearing. There are additional refinements available; but it probably would be some time, if ever, before there could be any move to make these mandatory.

What railroads now have is a means to give maximum improvement in journal performance in minimum time and with minimum investment. While more can be done, mechanical departments can take pride in results achieved to date.

AN IMPORTANT MESSAGE TO THE RAILROAD INDUSTRY:

Let's clear up all the confusion about hot box detection devices

Railroadmen deserve straight answers to basic questions. Here, Servo supplies them.

Various attempts have been made over the years to solve the hot box problem. While hot boxes still have not been eliminated, major advances have been made in their *detection.*

Eight years ago, electronic engineers of Servo Corporation of America went to work to develop an advanced system of infrared hot box detection. Today, as the result of their timely scientific breakthrough, twenty-six major Class I American railroads are guarding rights-of-way with hundreds of SERVOSAFE® Hot Box Detective† installations.

According to conservative estimates, SERVOSAFE Hot Box Detectives are currently inspecting an average of 467,000,000 journals per year.

Other manufacturers, witnessing the railroads' rapid acceptance of the revolutionary SERVOSAFE system, have naturally attempted to develop parallel systems. However, various misconceptions have arisen concerning hot box detection devices—misconceptions concerning basic scanning methods, optimum scanning locations, placement of equipment, and other fundamentals.

As pioneers and leaders in the development of hot box detection equipment, with years of research and actual application experience to lend support, we feel it is our duty to the railroad industry to set the record straight.

Q—How effective are hot box detection devices today?

A—The fact that some two hundred SERVOSAFE Hot Box Detective systems are in successful operation on twenty-six major Class I railroads leaves little doubt about the feasibility of this patented, time-tested safety system. Several roads have installed the equipment on a system-wide basis. New roads are adding the SERVOSAFE system every day. At an interchange point on the Reading Company lines, for instance, a number of hot boxes were going by undetected on incoming cars. Ever since installation of the SERVOSAFE system at this critical point, however, hot boxes have been detected consistently on both sides of the train.

Q—Can equipment cost be justified?

A—In recent years, on the average, hot boxes have cost American railroads $8-10 million annually as the result of derailments, damage, and delay. But consider the cost of just a single derailment—its broader consequences, cost of possible litigation, etc. In the words of a Pennsylvania Railroad official, "*...save one wreck...and the* SERVOSAFE *Hot Box Detective system has paid for itself.*"

Q—How about performance reliability?

A—Day in, day out, in all kinds of weather, no passing journal can escape inspection and detection by the infrared trackside scanners. Many roads are reporting better than 90 per cent efficiency using SERVOSAFE Hot Box Detectives...in some instances, as high as 100 per cent.

Q—Does the equipment actually measure bearing "temperature"?

A—No. No hot box detection equipment can claim to measure the "temperature" of an overheated bearing as such. To maintain this is definitely misleading. However, measurement of specific bearing temperature is not the real issue. In the development of the SERVOSAFE Hot Box Detective system, Servo engineers investigated this approach as well as a number of others. Absolute temperature measurement was ruled out as impractical and unnecessary. Comparative or relative heat measurements are the key, as explained in the following paragraph.

Q—How are hot boxes detected?

A—Take the SERVOSAFE Hot Box Detective. Trackside scanners inspect each passing journal; a chart recorder at a convenient control location simultaneously records relative heat level of each journal. The scanners can read all types of journal bearings—friction, sleeve, and roller types. Heat sources other than journals are screened out through electronic circuit discrimination, so that false indications are minimized. Each journal is represented by a "pip" on the chart (Fig 1). Normal journals show peaks of approximately the same height. Abnormally high peaks, signifying overheated journals, are readily apparent. Exact location of the defective journal can be determined by counting the number of pips.

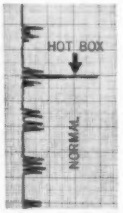


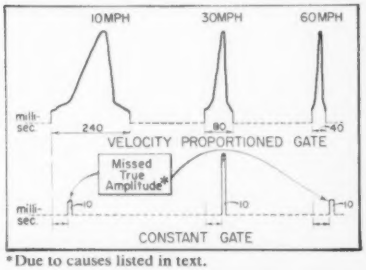
Fig. 1—Tall "pip" on chart pinpoints hot box.

Q—Why are thermal detectors superior to photo detectors for journal heat detection?

A—Simply because devices such as photo detectors can easily give rise to false indications. Instead of giving consistent sensitivity over a broad range of infrared wavelengths, photo detectors show much greater sensitivity in the near infrared spectrum (say, for reflected sunlight) than in the intermediate infrared spectrum where journal box radiations are peaked. Thermal detectors, by comparison, have uniform sensitivity throughout the spectrum from visible to far infrared. In other words, they are not any more sensitive to extraneous radiation than to target radiation. Significantly, Servo has been one of the pioneers in infrared for aerial reconnaissance, submarine detection, and industrial process control since World War II.

Q—Why is the method of "gating" so important?

A—By "gating", of course, we mean the interval in which the scanner views the journal and the recorder charts the amplitude of the heat pulse. "Constant gate" systems record heat pulses only during a constant time interval. As a result, different areas of the journal box are viewed at different train speeds. Chief drawback of the constant gate is the distinct possibility of completely missing hot boxes. (Fig. 2) The SERVOSAFE "velocity proportioned gate" on the other hand, always views the same area of the journal box—always records comparative heat pulses—regardless of train speed.



*Due to causes listed in text.

Fig. 2—Type of gating is critical. With "constant gate" systems, hot boxes may actually be missed entirely. The above curves indicate possible displacement of gate impulse relative to heat impulse due to varying train speeds, not to mention such other causes as lateral motion of wheel flange, depth of flange, askew trucks, scanner alignment, and rail creepage. Note that constant gate may lead or lag the important part of the heat profile. In the constant-gate situation depicted, wheel-transducer location has been assumed optimum for 30 mph train speed; misleading information is obtained at speeds of 10 and 60 mph.

In the Servo velocity proportioned gate system, the gating impulse is long compared to the heat impulse, assuring bracketing of the heat impulse regardless of the listed causes for shifting of the gate impulse.

In the case of a narrow, constant gate impulse which is short compared to the heat impulse, the "jitter" of the gate impulse due to the listed causes allows the possibility of missing hot boxes.

Q—Why is the particular area the scanner views considered so critical?

A—Here you must consider the basic nature of hot boxes...yes, and incipient hot boxes. Either the bearing is already

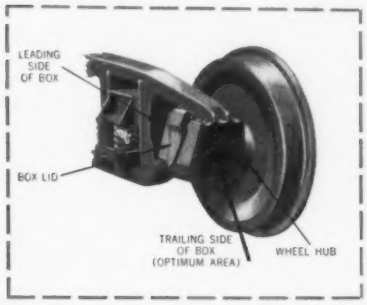


Fig. 3—Servo railroad tests confirm that the best viewing area is the back of the journal box.

running abnormally hot—or temperature is rising rapidly enough to suspect a hot box may be developing. Therefore, the area the scanner views must simultaneously (a) be as close to actual journal brass temperature as possible, and (b) rapidly respond to temperature changes. Tests conducted by a major Eastern railroad** prove that the optimum accessible area satisfying both these basic requirements is the back of the journal box (Fig. 3), the spot which presents a low-mass path of thermal flux from the bearing. The SERVOSAFE "slant-aspect viewing" method of scanning this optimum spot is guarded by Servo patents both in the U.S. and abroad.

**(Name on request)

Q—What is meant by "bi-directional" scanners?

A—Simply that a single pair of scanners can view trains moving in both directions. More is made of this feature than it deserves. Common practice is to position SERVOSAFE scanners so that they can view the rear of the journal box, for reasons described above, as the train is moving away from the scanners. Obviously, the same scanners could be used to inspect approaching traffic as well, if provision is made for switching transducer sequence. (Available and optional.)

Q—How can hot boxes be pinpointed quickly and accurately on a long train?

A—Reading the chart records, as described above, is simple enough. However, SERVOSAFE systems are available which include an automatic alarm and an automatic Hot Box Locator to speed identification. Counters and numerical indicators make it possible to determine at a glance the exact side, car, truck, and wheel where the hot box is located. (Fig. 4)

Q—How about power requirements?

A—While power requirements for operation of the SERVOSAFE system are stated as 850 watts, it should be understood that most of this power (750 watts) is consumed in heating the units—for melting snow and keeping the ambient temperature high within the scanner head. Power requirements for operation of the SERVOSAFE detector, exclusive of heaters (50 watts), are actually less than those specified for competitive detectors.

Q—How about remote operation?

A—The SERVOSAFE system is capable of transmitting information over any standard communication channel—direct wire, carrier, or microwave. SERVOSIG® Carrier transmits accurate data up to 40 miles over open wire lines with minimum distortion and noise (15 miles using telephone cable of #16 AWG wire or larger). However, standard voice-frequency repeater amplifiers may be employed to extend these distances up to 100 miles or farther. (Fig. 5)

Q—Isn't site selection quite important?

A—Quite definitely. Site location, type of system—both are extremely important considerations. With eight years of development and application experience to draw upon, SERVOSAFE engineers are able to recommend the optimum location for the precise SERVOSAFE system to handle each individual hot box detection problem.

Q—Isn't system flexibility an important consideration, too?

A—Yes, of course, flexibility is fundamental. The SERVOSAFE Hot Box Detective is available in six operational systems to meet all possible requirements—yard and terminal inspection, interchanges, main line right of way, intermediate inspection, bridge, tunnel, and hazardous location protection, etc. In addition to the basic SERVOSAFE system, there are five flexible expanded system Groupings to choose from—all proved and in successful operation.

Fig. 4—Trainman checks Grouping IV Hot Box Locator (basic system plus automatic alarm with carrier; wayside recorder) at remote location on main line.

Q—Who is responsible for installation and start-up operation?

A—Installation and start-up operation of all SERVOSAFE Hot Box Detective systems are supervised by SERVOSAFE specialists as standard procedure. In addition, periodic routine inspection is performed by SERVOSAFE specialists stationed in the area.

Fig. 5—Boston & Maine dispatcher has hot box information flashed to Boston office from detection point approximately 90 miles away over leased New England Telephone lines. System also employs Grouping I SERVOSIG Carrier.

Q—What about training of railroad personnel?

A—Servo's Railroad Products Division conducts regular SERVOSAFE Training Schools both at the plant and in the field, depending upon the individual railroad's needs. Railroad personnel are thoroughly trained in operation and maintenance of the equipment.

Q—What's the story on maintenance?

A—All components of the SERVOSAFE system—trackside scanner, wayside equipment, office equipment—follow the modular "building block" principle to make the equipment easy to check, adjust, and maintain. And as an added safety feature for personnel, the system is designed so that only the minimum necessary equipment is placed at trackside. Other components are housed in a standard wayside signal case out of the way of traffic. All tests may be conducted at the signal case.

Q—How about purchasing arrangements and delivery?

A—Both purchase and lease arrangements are available. Immediate delivery on the basic SERVOSAFE system...slightly longer on one of the five other expanded system Groupings. Specifically, if the basic system is ordered today, it will be shipped in 48 hours or less.

Here, we have attempted to provide straight answers to some of the principal questions being asked today. If you have further questions—or if you would like to discuss the requirements of your particular road—contact the Railroad Products Division. A SERVOSAFE railroad specialist is waiting to help you. There are sales and service specialists in key areas. ■

†Protected by U.S. & Foreign Patents, including U.S. Patents No. 2,880,309 and No. 2,947,857. Other U. S. & Foreign Patents Applied For.

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New facts about Shell Talona RS Oil 40 performance are still coming in from railroad operators across the country, all pointing to a new concept of locomotive diesel crankcase lubrication.

For example, one major railroad using Talona® RS Oil 40 in heavy-duty freight service reports that its diesels have run in excess of 200,000 miles and give no indication of requiring an oil change.

Railroad operators with the most experience using Talona RS Oil 40 are convinced that diesel engine life between overhauls can be greatly extended too. Furthermore, their experience indicates that Talona RS Oil 40 will last for the full overhaul life of the engine.

• • •

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SHELL TALONA RS OIL 40 is specially compounded for today's high-output railroad diesel engines.

Twice the anti-wear protection. Results show that Shell Talona RS Oil 40 will give *at least 4 years* of service between engine overhauls against 2 years or even less with conventional oils.

Longer filter life. Shell Talona RS Oil 40, with its excellent filterability, safely absorbs more contaminants than conventional diesel lubricating oils . . . affording still further dollar savings by extending filter change periods. It holds contaminants in a finely divided state to prevent sludge deposit formation which could interfere with proper lubrication.

Unmatched engine cleanliness. Talona RS Oil 40 effectively fights deposit build-up . . . keeps engines remarkably clean. At the same time it cuts down oil consumption. And you know that a cleaner engine involves considerably less expense at overhaul time.

Excellent silver bearing lubrication. Shell Talona RS Oil 40 protects silver bearings. It has special extreme-pressure additives that provide effective built-in protection *for the life of your engine.*

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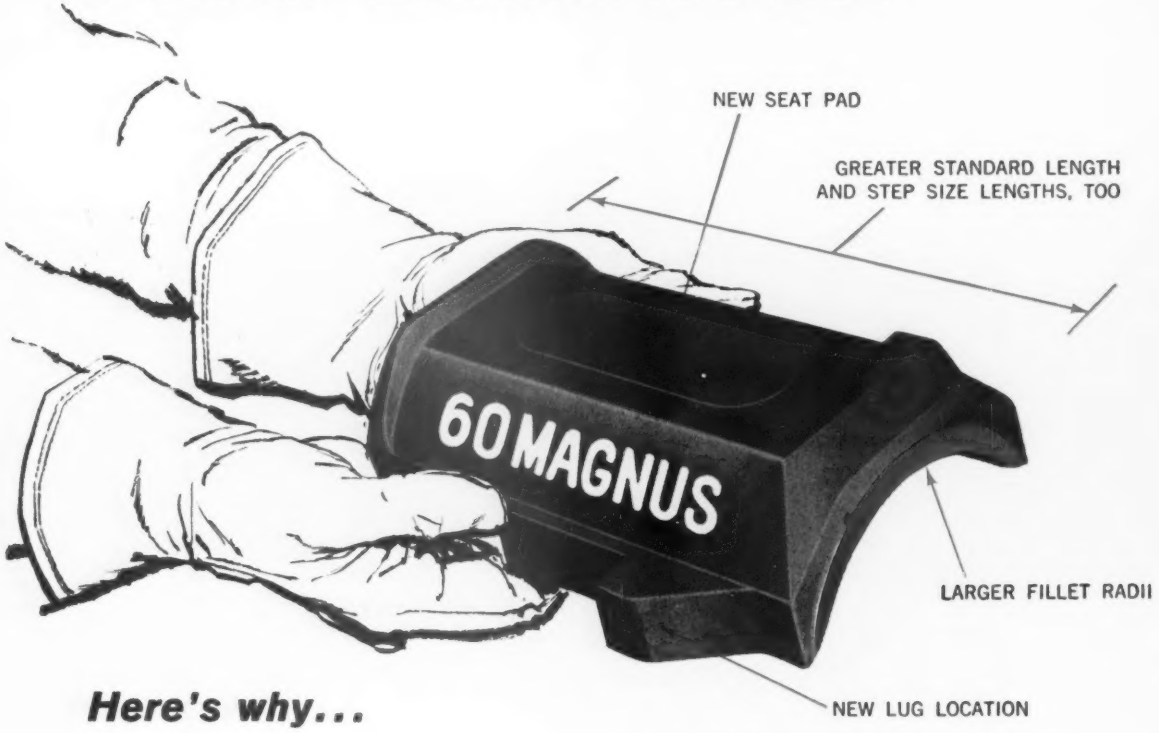

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THE NEW raised-back bearing (above) has been designed for better load distribution, reduces lateral play, equalizes thrust loads and reduces wiping at both fillets, promising improved performance and economy in freight car service.

The new raised seat pad gives controlled radial load distribution—puts preferential loading in the middle of the journal where lubrication is more abundant and uniform. This reduces heating and contributes to longer trouble-free mileage.

Standard bearings are ¼" longer, increasing bearing area and reducing lateral play. Step sizes are also increased in length, tending to reduce lateral play on worn journals. This, together with new lug location, gives more balanced thrust loading.

Fillet radii have been increased at both ends of the bearing for further reduction in end wear and reduced wiping of the babbitt.

These design modifications should help establish a new high in the performance of low-cost solid bearings. For further information write to Magnus Metal Corporation, 111 Broadway, N. Y. 6, or 80 E. Jackson Blvd., Chicago 4.

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Hydraulic Drive Facing U.S. Tests

German-built 4,000-hp freight locomotives coming to D&RGW and SP in 1961 for heavy road service

Delivery of six 4,000-hy diesel-hydraulic road freight locomotives in the U.S. is now expected about March 1961. Already, the West German builder, Krauss Maffei, has begun assembly of the big A units. The 4,000 hp gives these locomotives the highest horsepower rating ever achieved with a single-unit diesel locomotive. Starting tractive effort will be 98,000 lb. They will be equipped for multiple-unit operation.

The Denver & Rio Grande Western and Southern Pacific each ordered three of these units in 1959 (RL&C, December 1959, page 8), although there was no official announcement until June 1960 during the annual meeting of the AAR Mechanical Division. At the San Francisco meeting, D. J. Russell, Southern Pacific president; S. M. Houston, SP general superintendent, mechanical department, and Dr. G. Wiens, head of the mechanical department of the German Federal Railroad (GFR), all gave some details of the 4,000-hp units for U.S. service. Dr. Wiens went on to tell of German experience with diesel-hydraulics and to explain why the GFR is thoroughly committed to this type of motive power for its non-electrified lines.

The U. S. diesel-hydraulics will weigh 144 tons and be 65 ft 11 5/16 in. between coupler pulling faces. They will have two six-wheel trucks, each of which will be driven by its own 2,000-hp Maybach MD 870 engine through a Voith hydraulic transmission (RL&C, June 1960, page 35). The six units will be used in heavy freight service.

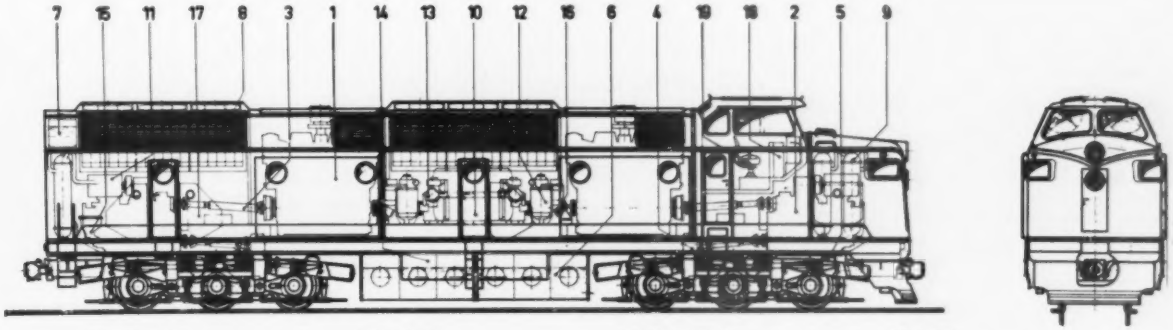
The diesel engine operates at a full-load speed of 1,500 rpm, is supercharged, and has aftercooling. It is a 16-cylinder, four-cycle Vee type with 7.3-in. bore and 7.9-in. stroke. An unusual feature is the tunnel crankcase with roller main bearings. (RL&C, August 1960, page 12). The high engine speed makes possible a compact power plant, enabling high horsepower to be installed in a single unit of conventional proportions.

A Voith transmission, purely hydraulic, consists of one or more torque converters and fluid couplings, depending on the speed range and prime mover for which it is designed. Gears are used for stepping down input shaft speed and for reversing, but there are no clutches.

Energizing of the correct hydraulic transmission ratio is effected automatically by filling and emptying of the proper oil circuits. This is controlled by a governor which measures both engine and track speed. At changeover points, the proper converter is filled via an oil-pressure actuated control system, depending on the transmission ratio best suited for the prevailing track speed. By overlapping emptying and filling, there is no interruption in the tractive efforts during changeover.

Top speed of the U. S. locomotives will be 70 mph. Their transmissions will be newly designed with the aim of eliminating much of the gearing and and incorporating hydro-dynamic braking. Hydro-dynamic braking produces the same results as electro-dynamic braking used on many U. S. diesel electrics.

As Dr. Wiens explained this braking system, "A braking effect is created



1 Diesel Engine
2 Hydraulic Transmission
3 Cardan Shaft
4 Intermediate Gear
5 Axle Drive Unit
6 Fuel Tank
7 Cooling Water Tank
8 Radiator
9 Heat Exchanger for Hydrodynamic Brake
10 Air Reservoirs
11 Generator
12 Cooling Water Preheater
13 Air Compressor
14 Battery
15 Toilet
16 Oil Pump
17 Sandbox
18 Control Stand
19 Cab Seat

Locomotive to be built by Krauss Maffei for U.S. will be this conventional A unit with single cab. The two 2,000-hp diesels will be mounted toward center of unit and will drive outward to the hydraulic transmissions mounted toward ends of the carbody.

in a torque converter as soon as its turbine wheel is driven faster than its driving range speed. To use this braking effect, it is necessary to reduce engine speed so far that the speed to be maintained by the braking effect will exceed the equivalent traction speed range. If the input shaft of the converter is stopped completely, maximum braking effect will be obtained. The GFR is carrying out measurements on this subject on a test stand. The 2,000-hy transmissions for the U. S. will be equipped with a hydraulic (vortex) braking feature.

General characteristics of the hydraulic transmission were discussed by Dr. Wiens. The components are the hydraulic torque converter and the hydraulic coupling. Both were developed in 1903 by Foettinger, a German electrical engineer.

"With diesel traction, all types of transmissions—electric, hydraulic, or mechanical—must meet the same requirements," Dr. Wiens said. "The transmission has to transform the constant power output of the diesel engine following the hyperbolic shape of the tractive effort curve as closely as possible . . .

"The hydraulic torque converter consists of three parts—a pump impeller, a turbine runner, and a stationary guide wheel—which are grouped in a close circuit . . . As with any other hydro-dynamic equipment, power transmission is based on the principle of accelerating a fluid mass in the pump by absorbing a torque from the input shaft of the torque converter. In the turbine, the fluid mass is decelerated, producing a torque that is transmitted to the output shaft.

"In contractst to the torque converter, the hydraulic coupling has only two members—a pump impeller and a turbine runer. In the absence of stationary reaction vanes (guide wheel), the input torque is always equal to the output torque under any operating conditions.

"Transmission efficiency in a torque converter reaches 85 per cent, and in a coupling, approximately 93 per cent. For railroad applications, a single torque converter will hardly meet all requirements. For starting and for negotiating grades, high tractive efforts are required, while high maximum speeds must also be achieved. This makes it necessary to take special measures to obtain reasonable efficiencies over the entire track speed range.

Transmission Arrangements

"Two basic methods can be adopted to do this:

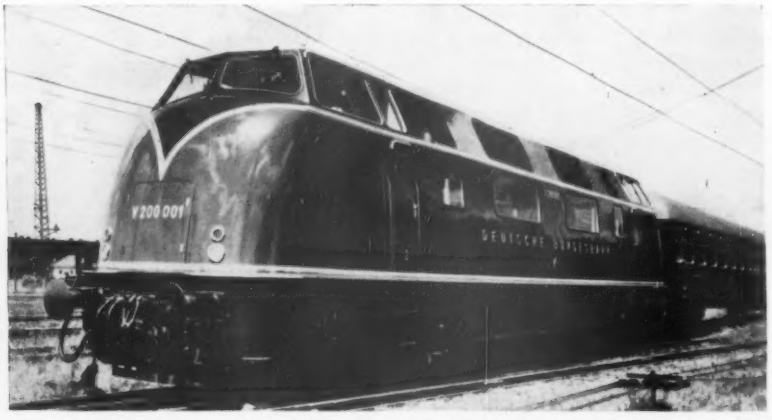
- Two or three hydraulic circuits are grouped in consecutive order. The power transmissions are made up either of several hydraulic torque converters for different speed ranges, or of a combination of hydraulic converters and hydraulic couplings. Each of the consecutive fluid circuits is associated with a well-defined speed range, the arrangement being such that each circuit operates at its optimum efficiency. [This is the Voith principle.—Editor.]
- A single torque converter, usually of a permanently filled type, is followed by a mechanical speed-change-gear box of three or four speeds." [This is the Mec-hydro principle. See RL&C, June 1956, page 58.—Editor.]

Dr. Wiens told how Germans successfully turned to hydraulic transmissions for diesel rail cars during the 1930's. Following World War II, the GFR was confronted with rebuilding and re-equipping its war-devastated system. Dr. Wiens cited the low initial cost of this transmission, its light weight and small size all as reasons for its utilization in road and switching locomotives during the immediate post-war period. By 1948, the decision was made to build nothing but diesel-hydraulics for the non-electrified lines. Concurrently with the acquisition of diesel-hydraulics for these routes, the GFR has been undertaking extensive electrification of all heavy-traffic lines. Subsequent experience has shown hydraulic transmissions to be sturdy and reliable, easy to control, and simple to maintain. Dr. Wiens said that for German operating requirements and fuel costs, the diesel-hydraulics give the GFR the most for its money.

He admitted that electric transmissions offer maximum flexibility in design of carbody and trucks, because power is transmitted through flexible cables. However, he said, experience with axle drives and cardan shafts today makes possible practical and economical arrangements. Today, GFR is able to operate cardan shafts, transmitting high torque, for 190,000 miles between inspections. Transmission inspections are normally confined to checks of oil levels and governor operation.

Torque Conversion Ratio

A primary advantage of the hydraulic transmission, according to Dr. Wiens, is its high torque conversion ratio (10 to 1). This allows the building of multi-purpose locomotives with maximum speeds in the 90-mph range and starting tractive efforts which can take full advantage of the adhesive weight. Dr. Wiens commented that there is a "widespread erroneous assumption" that the hydraulic transmission is quite suitable for express



Diesel hydraulic for basic main line freight and passenger service on the German Federal Railroad is this V-200, originally built with a rating of 2,200 hp. Latest models are rated at 2,700 hp. Each of the four-wheel trucks is powered by a separate engine and transmission. This is one of five basic diesel hydraulic models which the GFR has designed for its non-electrified lines. Others are: (1) the 53-ton, 650-hp V-60 switching locomotive which is a three-axle, rigid-frame unit with side rods; (2) the V-100 branch line locomotive, a 1,350-hp road switcher with a weight of 70.5 tons and two four-wheel trucks; (3) the V-160, a 2,000-hp carbody unit for light main line service with two four-wheel trucks; and (4) the V-320, a 4,000-hp heavy main line freight and passenger locomotive. This last is a counterpart of the SP and D&RGW locomotives. Like them, it will have two six-wheel trucks and two engines, but it will be fitted with two cabs. U.S. locomotives will have single cab.

trains, but not for heavy freights.

"Starting tractive efforts depends upon the power of the locomotive, its transmission, and on the factor of adhesion," Dr. Wiens said. "It is of prime importance for adhesion that the hydraulic transmission has all axles mechancilly coupled through cardan shafts in each truck. Operation has shown that higher coefficients of adhesion can be obtained with this type than with single-axle drives commonly used in electric transmissions.

"Torque through the hydraulic transmission builds up rapidly, but not abruptly as is the case when electric power is switched on. The speed-torque curve of the hydraulic transmission, which falls sharply in the starting range, is responsible for the fact that, when there is a tendency to slip, the torque drops to such an extent that equilibrium between starting tractive effort and adhesive force is restored."

Coupled Axles

With mechanically coupled axles, it is impossible to have slipping of individual axles; slipping of all axles on a truck is not too frequent. There is, according to Dr. Wiens, less tendency to unload the leading axles of the locomotive trucks during starting when there is hydraulic group drive than is the case with individual axle drives. Summarizing: "With equal locomotive weights, a locomotive with hydraulic group drive will develop higher starting tractive effort and will be capable of pulling heavier trains on grades . . .

"The hydraulic transmission meets all continuous tractive effort requirements. At low speeds, the full diesel engine output can be transmitted with no time limit . . . Heat developed in electric machines cannot readily be dissipated. The heat which develops in the hydraulic transmission can be dissipated by the oil itself, because the specific heat of oil is five times that of copper. With hydraulic transmissions, external heat exchangers and radiators can be provided to dissipate any quantity of heat."

Maximum tractive effort can be exerted at standstill for a "practically unlimited period of time" without transmission damage. This is a factor in the starting of trains in cold weather, or when brakes have not released completely. This was demonstrated with a standard GFR 650-hp switcher which was allowed to push against a bumper at full throttle for long periods without transmission damage.

Unsprung weights are reduced with the hydraulic transmission so that the locomotive riding characteristics can be superior to those of the units with trucks having nose-suspended traction motors, Dr. Wiens said. Small space requirements and low weight of hydraulic transmissions make possible smaller, lighter locomotives. "Low locomotive weight is of extreme importance in Germany, because the price of fuel oil, including transportation, customs duties and federal taxes, is approximately twice as high as fuel in the U.S. Furthermore, low weights are of special concern to the German Railroad, as the maximum axle loads are limited to 22 and 23.2 tons."

German Experience

Standard diesel-hydraulic road locomotive in Germany is the V-200, designed for handling medium passenger and freight trains on main lines. First of these units was delivered to the GFR in 1953; there are now 86 in service. Additional units are on order.

Originally these 92.8 ton units were powered with two 1,100-hp high-speed diesels. Subsequently some of the units have been powered with two 1,200-hp engines. It is now planned that 1,350-hp engines will be used; this will put the rating of the V-200's yet to be delivered at 2,700-hp.

While the V-200's are usually in long-distance passenger service, Dr. Wiens pointed out that this was the result of a need to replace steam locomotives on high-speed runs. This should not, he emphasized, be interpreted as an indication that the hydraulic transmission is unsuitable for heavy freight trains. "As far as the restricted number of locomotives permits, the V-200 has been operated in freight service where it has proved its reliability," he said.

The average V-200 operates 620 to 750 miles daily producing an annual figure of 125,000 miles. On long-distance, high-speed expresses, a V-200 is rated at six cars or 250 tons. On heavy express trains each unit handles up to 15 coaches, 650 tons.

Currently these locomotives are shopped at 370,000-mile intervals, corresponding to three years of operation. It is possible that this may be extended to four years. According to Dr. Wiens, neither of these shopping periods would be governed by transmission wear. Because all components of the hydraulic drive are permanently bathed in oil, wear is "extremely low," he said.

The 86 V-200 locomotives are now accumulating 15 million miles per year. Maintenance of the 1,100-hp engine is $16.15 per 1,000 miles; transmission maintenance has proved to be $9.60 per 1,000 locomotive miles. Over a 30-year life, the light and heavy repairs together with a spare parts investment, is expected to average 14.2 cents per locomotive mile.

Recent refinements in methods for doing work at running repair shops are expected to reduce man-hours expended on light repairs so that they will not total more than 20 percent of those involved in the periodic inspections. If the new system is completely successful, Dr. Wiens said, maintenance costs over the life of the V-200 should be only 12.7 cents per mile.

The German Federal Railroad is not irrevocably committed to the hydraulic transmission, Dr. Wiens pointed out. Technical advances in electrical transmissions are constantly studied by the GFR. In addition, lines carrying the heaviest traffic are being fully electrified.

Transmission Maintenance

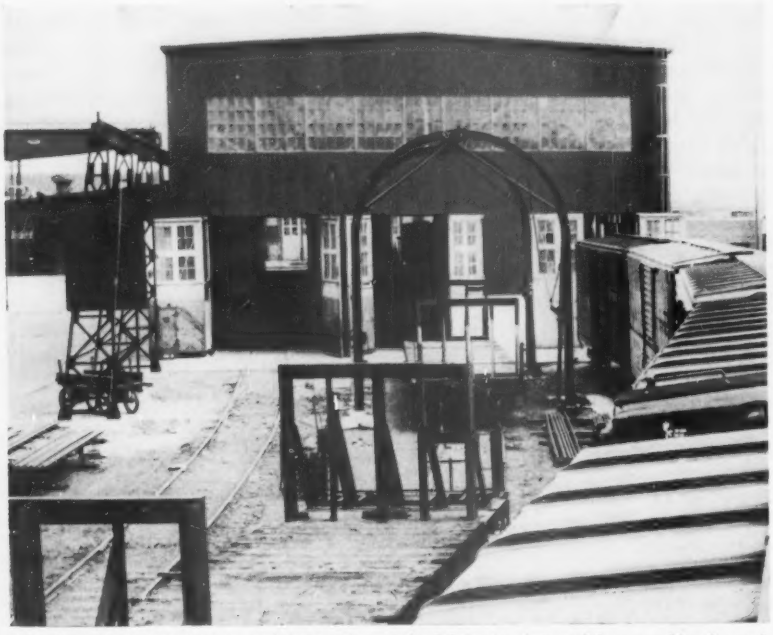
Lightest of the standard German diesel hydraulics is the three-axle 650-hp switcher known as the V-60. By last June there were 560 of these locomotives in service. To determine a maintenance schedule for the Voith L37 transmission, drive units from individual locomotives are being opened at increasingly higher mileages. Inspection after a maximum of 25,000 working hours shows no need for overhaul. Costs have proved to be 6.4 cent per locomotive hour for the transmission and 11 cents per hour for the 650-hp Maybach engine.

Nations outside Germany are adopting the hydraulic transmission. Dr. Wiens said orders for about 250 units with ratings in excess of 2,000-hp have been placed by various railroads of different nations.

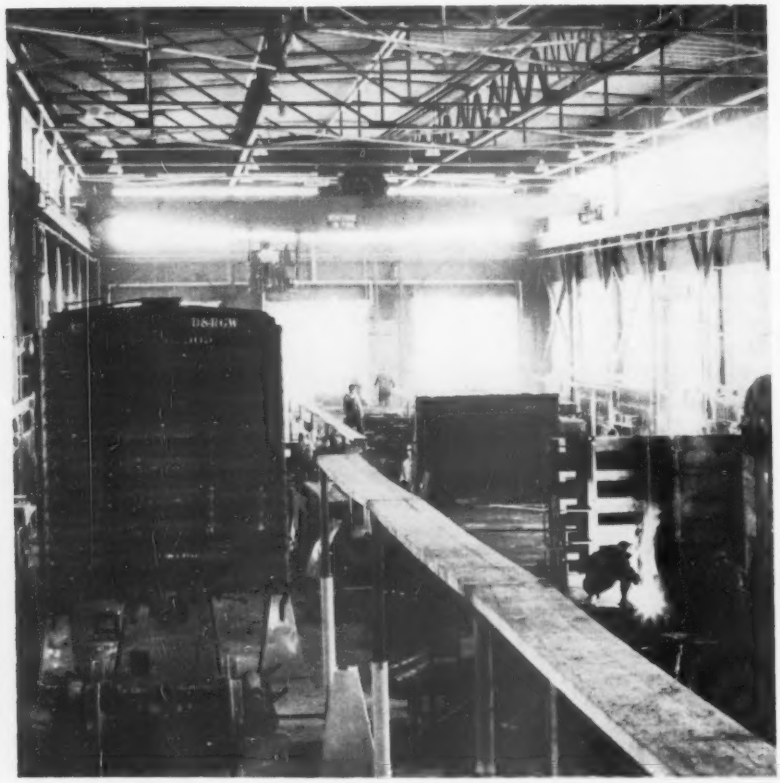
Dr. Wiens said that coupled axles are gaining popularity on locomotives with electric drive. The General Motors 800-hp GA-8 locomotive has cardan-shaft drive from its two body hung traction motors (RL&C, January 1959, page 18). Late French electrics have a single motor on each four-wheel truck. It is geared to both axles.

On the Rio Grande . . .

New Facilities Speed Car Repairs



Extension of main repair shop and construction of the fabricating bay at left are making it possible for Rio Grande to step up repair rate. Material storage has been completely revised.



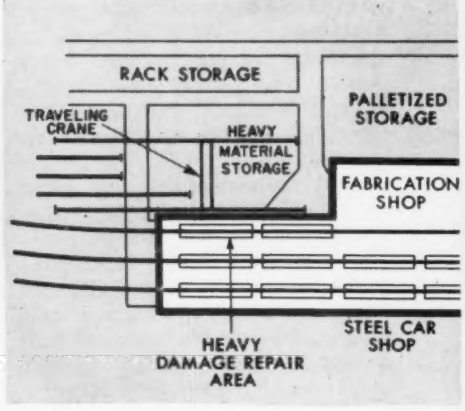
Two production tracks, on which box and bulkhead flat cars are standing, extend through the shop. Third track at right is used for special repair work and also for truck overhaul.

Modernization of the Denver & Rio Grande Western's Burnham steel freight-car repair shop at Denver, Colo., including extensions and new facilities, is expected to provide capacity for an output of eight heavy repair cars per day. The addition of a 120- x 64-ft extension to the original steel car repair building has made it possible for different types of cars to be programmed on adjacent tracks at the same time. Establishment of production-line techniques, adoption of modern methods of materials handling and installations of the lastest machine tools were all part of this renovation.

Three 360-ft tracks through the shop provide a total of 21 car repair positions. Two positions on one track are set aside for repairs of wreck damage when program repairs are being made on the other two lines. Air-brake equipment is sent to the locomotive shop for overhaul.

All-steel gondolas were shopped during the first quarter of 1960. This year's schedule also includes gondolas, box cars and the relocation of bulkheads on bulkhead flat cars. Present working schedule is one shift, five days per week.

Shop floors are concrete, and oxygen, acetylene, air and water are piped throughout, with stations at 24-ft intervals on both sides of the shop. Electric bus ducts on both sides give added flexibility for electric welding. Shop equipment includes two 15-ton overhead bridge cranes and removable scaffolding for all tracks. Materials



Heavy metalworking tools are now located in new fabrication bay. Material storage is adjacent to this building.

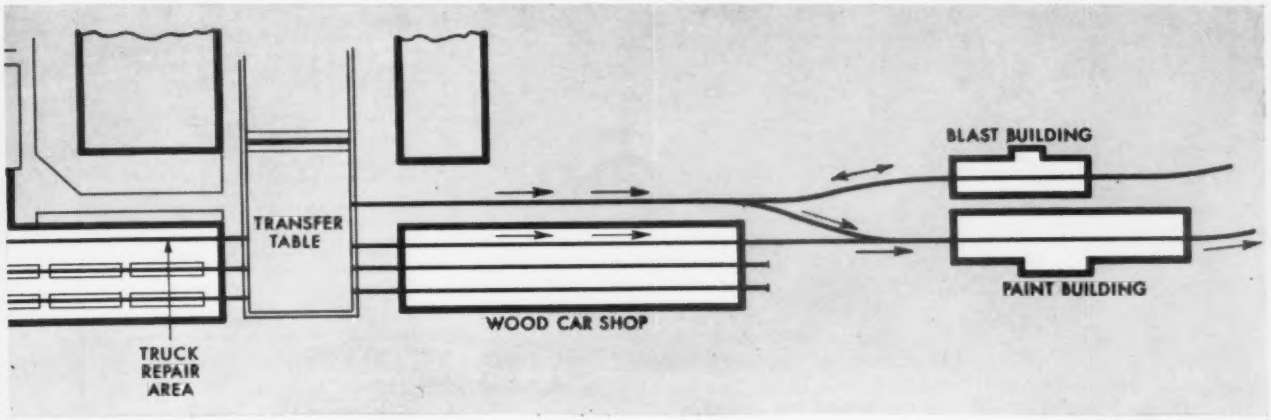
Traveling paint spray booth is major feature of new paint building. Cars are prepared for painting in a new grit-blast building.

handling equipment includes Chore Boys and a Roustabout crane. A new wash, locker and lunch room is in the west end of adjacent coach shop.

Fabrication of freight-car components for the production lines is done in the blacksmith shop and in a new fabrication shop which is a 40- x 96-ft extension on the west end of the main shop. An overhead monorail serves all machines in the fabrication shop. These include a Linde-Oxweld CM-41 shape-cutting machine, two punch-and-shears, tool hammer, Cincinnati 11-in. heavy duty drill press, and 150-ton Cincinnati press brake. The press brake fabricates such parts as door posts and corner posts and can punch up to 40 rivet holes at one time for box-car side sheets.

The material storage area adjacent to the fabrication and main shop has concrete runways and paved palletized storage. It is equipped with a 50-ton overhead crane and storage racks and platforms. Heavy repair cars come in from the north end and are spaced for stripping on two 800-ft tracks leading into the shop repair tracks. Each stripping track has oxygen, acetylene, air, water and car-pulling stations.

Finished cars move south from the steel repair building through a grit-blast building and to a new 180- x 26-ft paint building. The DeVilbiss traveling paint booth is equipped with a four-color, circulating hot-paint-spray system. The stencil shed has powered scaffolding which carries all necessary stencils and material. This scaffolding is controlled by painters on the scaffold.



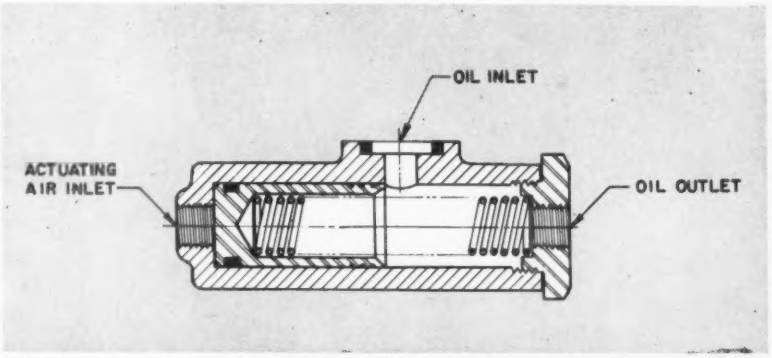
With Larger Oil Supply . . .

Compressor Requires Less Servicing

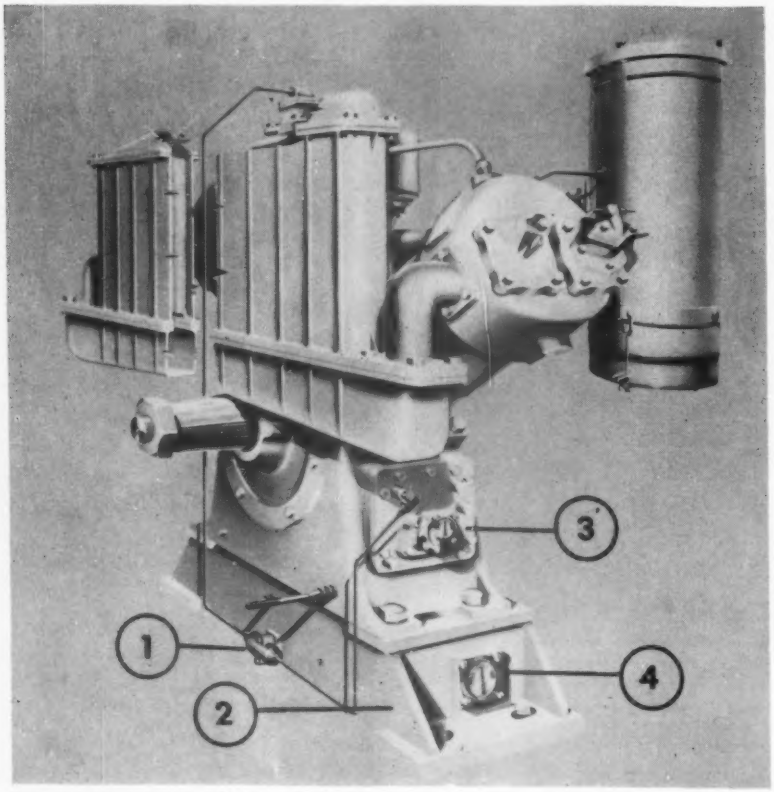
Air compressors with auxiliary lubricating-oil tanks are being tested on Illinois Central GP-18 locomotives. Electro-Motive Division of General Motors Corporation has taken the Gardner-Denver water-cooled WBO compressor, added a 10-gal oil-supply tank, and expects a year's operation without any inspection or addition of lube oil.

The welded sheet metal supply tank is in the base of the compressor. A piston type pump, operated by compressor unloader air, transfers oil from the tank to the crankcase. When the unloader is actuated, air pressure in the unloader line to the pump moves a spring-loaded piston which forces about 0.4 cu in. of oil to the compressor through a line running from the pump to the compressor crankcase. A ½-in. copper tube overflow line from the crankcase to the supply tank maintains the oil at proper level in the crankcase. The supply tank is equipped with a float level gauge, and is filled through a 1¼-in. standpipe.

Tests have shown that today's water-cooled compressor so reduces oil consumption that the auxiliary supply is considered adequate, even with elimination of monthly inspection and servicing periods. In addition, this arrangement prevents mixing of brands, or use of improper gravity oil while a unit is being serviced. Compressors have been installed on IC units 9413 and 9414 for test. These locomotives operate out of Paducah, Ky., through the coal fields and on in to Louisville. Three other compressors are to be applied on a western road.



Lubricating oil transfer pump is mounted at the side of the compressor crankcase. Piston is returned by spring so that the oil overflow line inlet is uncovered in preparation for the next stroke of the pump. Pump is actuated by air from the compressor unloader valve, to which it is connected by a special line.



Compressor components include (1) oil transfer pump; (2) auxiliary lube oil supply; (3) lube oil filler and float level gage; and (4) auxiliary lube oil float level gage.

TORONTO TRANSIT COMMISSION TENDERS FOR SIGNAL CONTRACT SGI BLOOR-DANFORTH-UNIVERSITY SUBWAY

Sealed tenders endorsed "Signal Contract SGI Bloor-Danforth-University Subway" and addressed to the Toronto Transit Commission, General Secretary's Office, will be received by the Commission at its office, 1900 Yonge Street, Toronto 7, Ontario, Canada, until four (4) p.m. Eastern Daylight Saving Time (three (3) p.m. Eastern Standard Time) on Monday, October 17th, 1960.

The work for which tenders are invited consists of providing and installing block signal and interlocking equipment for approximately 12,000 feet of subway as specified in the contract documents and shown on the contract plans.

All tenders must be on the Commission's form of tender and must be accompanied by cash or a certified cheque in the amount noted in the Tender and Contract Requirements.

The successful tenderer will be required to furnish, execute and deliver to the Commission a performance bond satisfactory to the Commission in the amount and within the time set out in the contract documents.

The contract documents, including plans and specifications, will be available at the Commission's Subway Construction Branch, 1138 Bathurst Street, Toronto, on and after Tuesday, August 2nd, 1960. Copies of the contract documents may be obtained by depositing one hundred dollars ($100.00) with the Commission for each set of documents. The amount of the deposit will be refunded on the return of the plans and specifications in good condition within thirty (30) calendar days after the opening of the tenders.

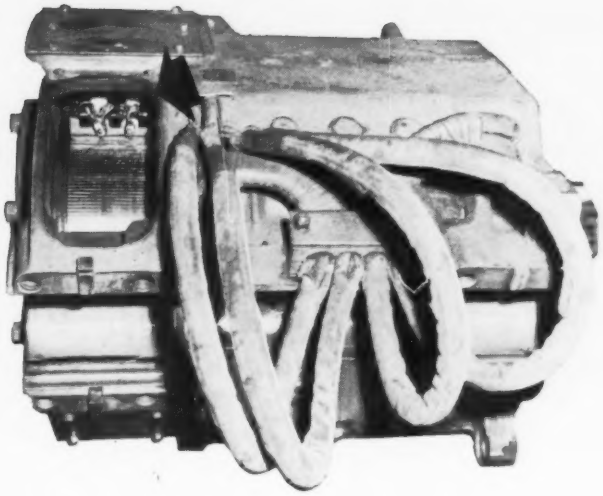
The Commission reserves the right to reject any or all tenders.

No tender may be withdrawn after the scheduled closing time for receipt of tenders for forty-five (45) calendar days.

H. E. PETTETT
General Secretary

"Only one traction motor brush can keep up with the tonnage-train traffic on the L&NE!"

comments Mr. Edward C. Kaiser, Chief Mechanical Officer



"The Lehigh & New England is an all-freight railroad," Mr. Kaiser continues. "Tonnage trains that put peak loads on motive units are the everyday story. Grades as steep as 2.4 and sharp curves mark the contour of the line – a combination that requires lots of dynamic braking.

"When you turn a traction motor into a generator at the operating speeds and loads prevailing on the L&NE, the brushes have to be able to take real punishment."

Experience has taught the L&NE that SPEER Brushes were the only brushes tried by it that could take this treatment – and stand up. "We have used SPEER Traction Motor Brushes (grade E-44) exclusively for over four years on all road units and road and yard switchers." Mr. Kaiser concludes, "It is the only brush that has stood up satisfactorily."

We can't think of a better endorsement for the brushes that have proved themselves in millions of miles of this kind of railroad service. SPEER builds a complete line of high-performance brushes for every railroad application. If you'd like to know more about the important cost savings that are built into all SPEER Brushes, write today for your free copy of the booklet, BRUSHES BY SPEER!

SPEER Carbon Co.
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In history-making contract, Pennsylvania Railroad orders

GULF MAKES THINGS

One of the largest lubricating oil contracts in the history of railroading has been awarded to Gulf by the Pennsylvania Railroad to supply 2,500,000 gallons of Gulf Dieselmotive 79 during 1960. This contract is part of a continuing P.R.R. program to provide better service to its customers.

Gulf Dieselmotive 79 was approved for service in P.R.R. locomotives after extensive road tests patterned after Association of American Railroads test procedures. Tests were conducted on several locomotives, each operating a total of more than 130,000 miles and 3,000 hours in heavy duty freight service.

Let us show you how Gulf can solve *your* lubrication problems. Call your Gulf office and ask for the complete story of Gulf® Dieselmotive lubricating oil. You'll find that in every application, Gulf makes things run better.

The famous Horseshoe Curve on the P.R.R.'s main line west of Altoona, Pa., has long been a landmark for travelers. Hauling heavy freight and fast passenger trains over this magnificently engineered four-track railroad is a genuine test of equipment and lubricants.

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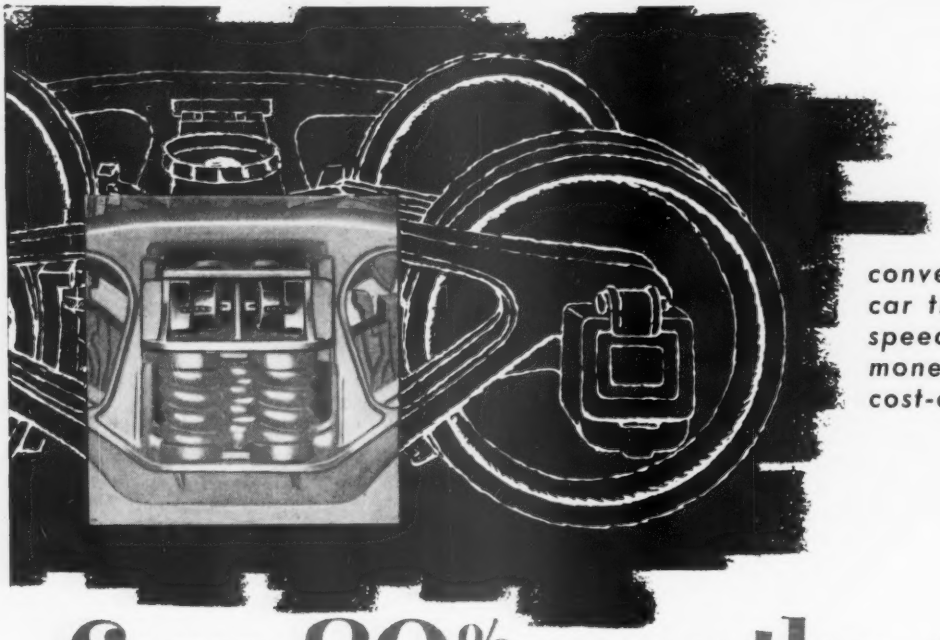
Houston 1, Texas

Looking on during spectrographic oil tests at P.R.R. Testing Laboratory are (left) M. A. Pinney, Engineer of Tests, Pennsylvania Railroad, and C. D. Gilchrist, Gulf Sales Engineer. Thousands of tests like this, over a period of years, confirmed the acceptability of Gulf Dieselmotive 79 oil.

SP-9880



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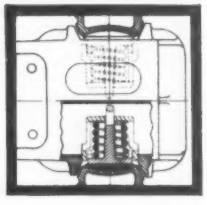
with the NEW HOLLAND RIDE STABILIZER RS-2

There's no need to let those serviceable old Freight Car Trucks be limited to slow speed service when you can convert them to profitable operation at a fraction of the cost of new trucks... The Holland Ride Stabilizer RS-2 has proven to give the same high-speed, lading-protecting, easy-riding characteristics you get in new, costly freight trucks.

You can convert any bolster of A. A. R. approved design and stabilize the ride laterally, vertically and longitudinally... The direct spring loaded control system of the Holland RS-2 **does not** cause uneven wear of the Journal Bearing when abnormal forces are exerted. Wedge made pressures just **do not** occur. Installation of the RS-2 components is unusually simple... And Holland Engineers will give you on-the-job assistance.

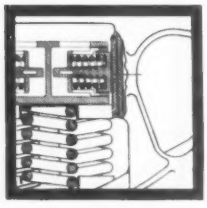
Write or call for the new Tell-All Bulletin RS-2.

NEW

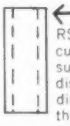


New Large control spring for full face pressure, longer life.

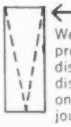
NEW



New Center Retention Means for simplified assembling and dismantling.



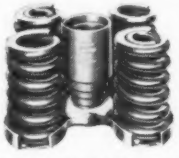
RS-2 Spring cushioned pressures do not disturb load distribution on the journal.



Wedge made pressures disturb load distribution on the journal.

Holland Volute Snubber Springs

Either 2½" or 1⅜" Spring Travel.



STYLE E-2 Volute Snubber Spring, 2½" Travel in 50 Ton Group.

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Melting the Ice

By Ken Wright

"We'd better get busy; this car has been in trouble for some time."

"Sure wish that I could play golf today instead of working," Pete remarked to the fellows that rode to work with him. "Weather's been beautiful! Last winter was so bad, I just can't seem to get enough sunshine. Seems that all of the ice in me hasn't melted yet."

Pete had not been at work long before his boss, Big Jim, came to him. "Pete, I've got another mechanical reefer problem for you. The yard is sending over a car with its temperature rising. Pick up Larry to help you this time. This is his first actual work on a mechanical car; I don't even have an idea how much he knows about them."

A short time later the car was spotted at the shop. Cooperation between yard and shop was excellent. Both groups realized that the lading of a mechanical refrigerator car could be worth up to $75,000. In protecting the loads and giving fast service, every little delay was important.

Pete first asked Larry to get the log book. Larry read that the car was loaded with frozen juice concentrate; thermostat was set for minus 10 deg. Last log book entry, prior to their terminal, was made at Browndale four hours ago. At that time the car's temperature was minus 3, with an ambient temperature of 62.

Pete checked and reported, "Well, the temperature outside is now 86 and the car's temperature is up to plus 4 deg. We'd better get busy; this car has been in trouble for some time."

"What's the hurry?" asked Larry, "The stuff is still frozen, isn't it?"

"I suppose that it's still frozen, but a few more degrees rise and it will start to melt. The sugar and acid in the juice will make it melt at a much lower temperature than would be the case with plain water ice. I recently read that steady temperatures seem to be more important than anything else when it comes to frozen food storage."

Pete and Larry found that both units of the dual system were working, but both compressors were heavily frosted. When Pete pointed out the frosted compressors, Larry asked, "If frosted compressors aren't normal, what could be the trouble?"

"It means that liquid refrigerant is reaching the compressors," Pete explained. He went on to enumerate the possible causes:

- Expansion valve too large;
- Improper superheat adjustment at expansion valve;
- Remote bulb of expansion valve not properly attached to suction line;
- Air not circulating through the evaporators;
- Defective expansion valve.

"I tell all of the fellows," Pete continued, "that I like to take the easy things first. Usually that's where trouble is found. An expansion valve is tough to check and fix. No one without proper tools and instruments should try to adjust an expansion valve. The easiest thing for us to look at is the evaporator.

"Let's see if the evaporator fan is running. Air must be circulated through the evaporator to remove the heat from the entire car. Without air circulation, then the space where the evaporator is will be cold, but the loading space will be warm."

Larry had been looking around while Pete was talking and asked, "How do we check the fan? I don't see it or its motor."

"You can't see it when there is a load in the car. The fan is located above the evaporator coil and the only way you can get to it is to have an empty car and then take down the end bulkhead. We don't have to see it though to check it. Get the clamp-on ammeter out of the tool kit."

When Larry handed the ammeter to Pete, he opened the jaws of the meter and slipped them around the

This is the thirteenth article in this series discussing the operation, maintenance and trouble shooting of mechanical refrigerator cars.

wire leads in the electrical panel. "You see, Larry, I have the wires leading from the evaporator fan starter and can read the current in the motor circuit. You must read all three legs of the three-phase circuit to be sure that the motor is not single phasing. If the reading is high, it can indicate a defective bearing or other defect causing an overload."

"Why wouldn't a voltmeter be just as good, Pete?"

"Because you might get a voltmeter reading but still wouldn't know whether the motor had an open circuit, was actually running, or was overloaded. Here you can know that the circuits through the motor are complete and the proper current is flowing. The reading shows the fan motor is running. Does that indicate air is circulating?"

"If the fan was disconnected from the motor, the motor could be running without moving any air," Larry finally responded.

"You overlooked a blocked evaporator coil—one full of frost, ice, or dirt. That would prevent air from circulating. At one time evaporators on some cars would not defrost completely because their defrost heaters were improperly placed. Car owners corrected that, so this must be something else.

"It could still be ice, frost, or dirt blocking the coil. This is a semi-envelope air distribution car. Wish it was easier to look into the evaporator, but I can understand why it isn't. That would cause leakage, lowering the system's capacity. Let's take a chance and assume that frost on the evaporator is our trouble. How would you put the system into defrost, Larry?"

Larry looked over the controls. "I don't see a timer. Something else must put the system into defrost. Haven't I heard you talk about an 'air switch?' "

"Yes, you did, Larry. It's this round black disc. Inside is a diaphragm with one side connected to the air space above the evaporator coil and the other side connected to the air space below it. If the coil is blocked or restricted, there will be a pressure differential across the coil. This moves the diaphragm, closing a switch and placing the system in defrost. After melting, coil temperature will rise to about 75 deg and a pair of thermal switches will open to terminate the defrost.

"On some cars builders have applied test tees in the two air lines to make it possible to attach a manometer. With about 4 in. of water in it, you can read exactly how much evaporator coil restriction there is. Without these test tees, we will have to jumper the defrost air switch contacts. How can we do this, Larry?"

"That's easy. Take the cover off the switch and jumper it there."

"It's true that could be done on this switch, but on some air switches, removal of the cover would destroy an air seal. You also run the chance of damaging a gasket. Go to the panel and install your jumper. The service manual in that holder over there has a wiring diagram in it. [See RL&C, February 1960, p. 31—Editor.]

Pete took a jumper from the tool kit and pointed to the air switch contacts on the print. Jumpering from terminal X1 to terminal 15 would be the same as having the air switch contact close. Pete warned that they were working with 220 volts. When Pete jumpered the two terminals, nothing happened. After checking, he asked Larry what would prevent the R-2 relay from closing to put the system in defrost.

Larry said it would have to be an open circuit between terminals 15 and X2—one or both thermal switches could be open; a wire could be disconnected, or there could be an open coil on the R-2 relay. "Shouldn't we try to jumper between terminals 15 and 16? That would eliminate the chance of a bad thermal switch."

Pete was in high spirits. He liked to trouble shoot; he liked a student that used his head. Pete removed the jumper from X1 to 15 and applied it from 15 to 16. The system went into defrost. "What was our trouble?" Pete asked.

"We only completed the circuit from 15 to 16. The air switch already must have been closed, meaning that there was already a pressure differential across the coil. The evaporator was frosted. One or both of the thermal switches could be open. According to the wiring diagram, they are set to open at 75 deg. Where are they?"

"Those switches are on the evaporator coil. All we can assume is that one or both of them are defective. As long as we keep the jumper on 15 and 16, the car will stay on defrost. Continued heating could damage the evaporator coil. In addition, we are not cooling the car."

"Could we wait until water stops running out the drain?" asked Larry.

"I doubt it. The coil is heavily frosted so it will take some time for the water to drain. We must also get the car back on cooling as soon as we can. We must defrost long enough to clear the coil. If we don't, we may have a solid block of ice. Then we would have to do it all over.

"I am going to guess 45 min. We will then remove one end of the jumper to take the system out of defrost and then reapply it. If the coil was not cleared, the air switch will put it back into defrost.

"We won't be able to release the car with the jumper in place. There would be no way to take it out of defrost. We can wire ahead and have the car placed on defrost as we did."

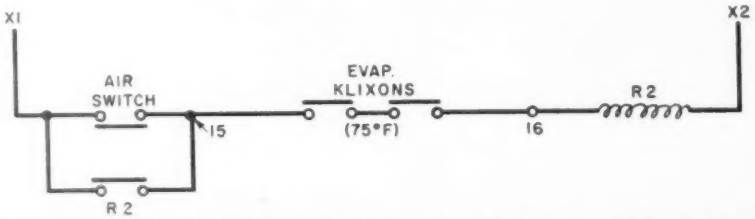
Larry was puzzled. Finally he asked, "Pete, what did the frosted evaporator have to do with the frosted compressors?"

"When frost blocked the coil, there was no heat to evaporate the refrigerant. Liquid refrigerant then passed through the coil and slopped over into the compressor. Heat was being absorbed by the refrigerant in the suction line to the compressor, forming frost. When liquid refrigerant is evaporated normally, nothing but gas passes through suction line to the compressor."

About this time, one of the fellows who had ridden to work with Pete came up and asked, "Did you get that ice all melted yet, Pete?"

"It's melting in more ways than one."

Pete had to grin—beautiful day, nice guys to work with, and lots of fun trouble shooting.



Pete showed Larry the portion of the control circuit which included the pressure differential switch and the temperature limit switches. They then checked to locate the cause of the failure.

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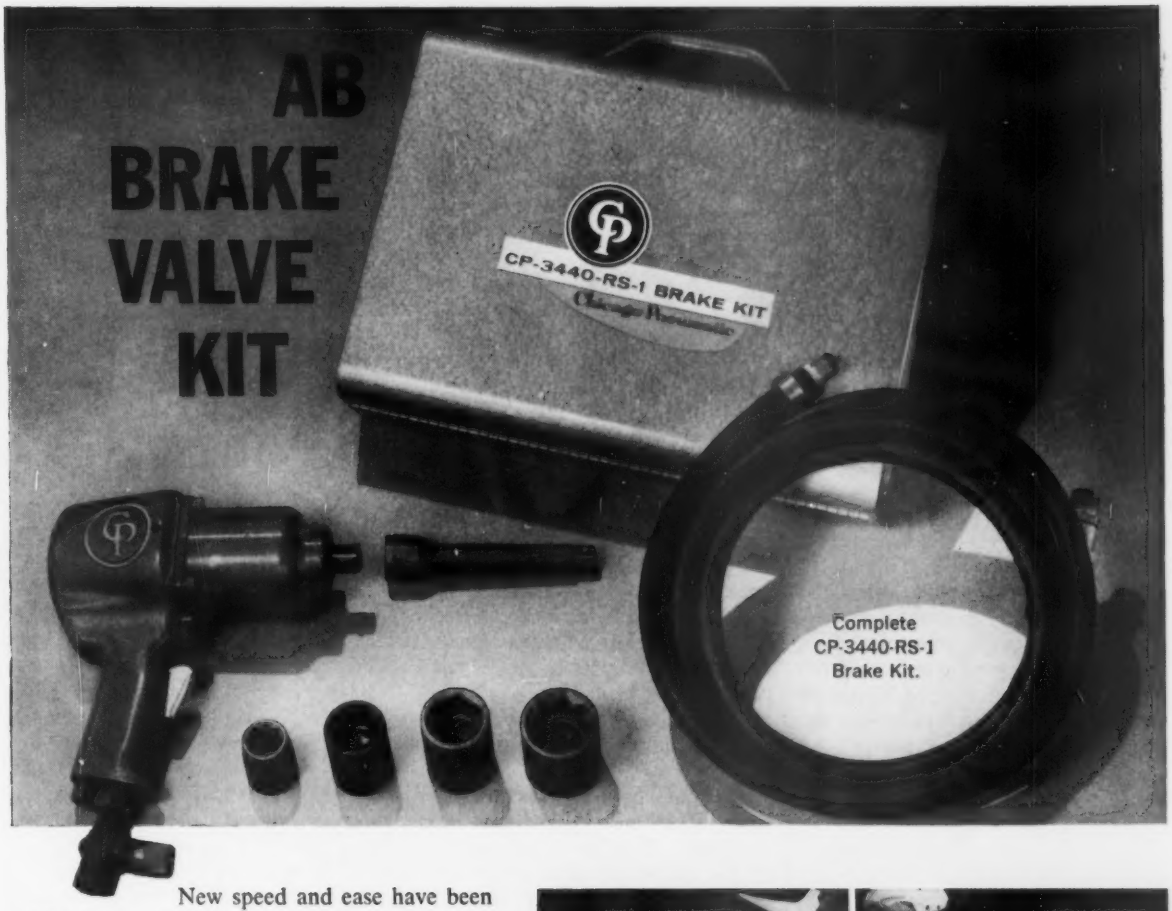

New speed and ease have been added to your freight car air brake maintenance problems. The new CP- 3440-RS-1 Brake Kit gives you just what you need for AB valve replacement, in a light, compact case. Heart of the kit is the CP-3440-RS air-powered Reversible Impact Wrench. This hard-hitting, time-saving wrench has controllable power, a 1/2" square drive, and can run-up brake valve bolts and studs in extremely close quarters. Included with the kit are four heavy-duty sockets, specially applicable to brake valve work, a 5" extension bar, and eight feet of 5/16" air hose. For full details, write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

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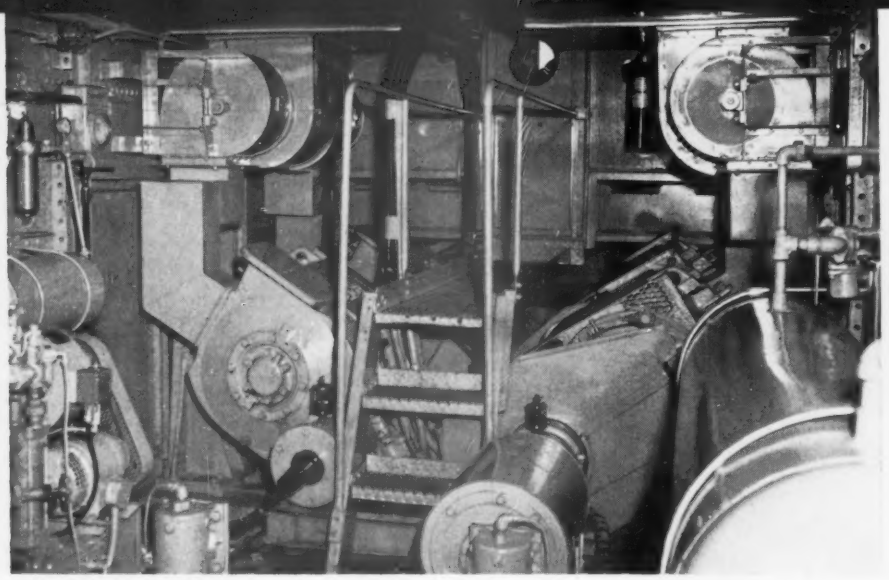


Plow body contains four motors driving rotor shaft (center), motor blowers (top), steam generator (left), and air cylinders for controlling the blade plow and rail scrapers (lower center).

Santa Fe Rotary Ready for Action

A rotary snow plow, built in Topeka, Kan., shops by the Santa Fe, is designed for use with diesel road locomotives. The plow rotor, driven by four GE-716 traction motors, is powered by the main generator of a diesel unit coupled immediately behind the plow. The plow is pushed by one or more diesel units coupled behind the unit furnishing the rotor power. All units are controlled from the plow cab.

Eight cables carry power from the locomotive unit to the rotor. A 27-to-21 pole receptacle at the rear of the plow couples the rotor control circuits to the control receptacle of the adjacent diesel power unit. A standard length 27-to-21 jumper cable is used when the rotor power unit has a 21-pole control receptacle. A 90-ft control jumper cable connects to a 16-pole receptacle at rear of plow and runs through the rotor power unit to the front of the first pushing unit. Two cables are provided for the connection if pushing units have either 21-pole or 27-pole receptacles.

The propelling (right) control station in the plow cab has control switches, throttle and reverse handles, automatic brake valve, whistle, bell and sander valve for locomotive control. A wheel slip light and buzzer, call and alarm buzzer, and call push button are connected only to the propulsion units. There is no provision for dynamic or independent air braking.

For units requiring manual transition, there are two switches in the plow cab. The TR-2 switch places the locomotive in transition 2. Leaving that switch on and turning on TR-3 places the locomotive in transition 3. The plow is not operated at speeds requiring transition 4.

There is no speedometer on the plow, so speed must be estimated when making transitions. Speed is allowed to rise above the proper transition speed to be on the safe side. Backward transition is made before the speed drops fully to the point at which transition should be made. If the pushing locomotives have automatic transition, the transition switches are left in the OFF position in the cab of the plow.

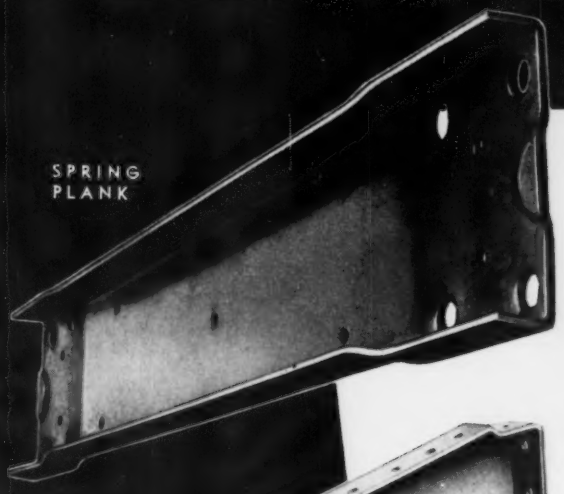
Air for brakes on the snow plow and all locomotive units is piped from the locomotive to a reservoir in the snow plow. In preparing for operation, the shut-off cocks are open in the main reservoir line between the snow plow and adjacent diesel unit. All brake pipe hoses are connected and angle cocks opened between all units.

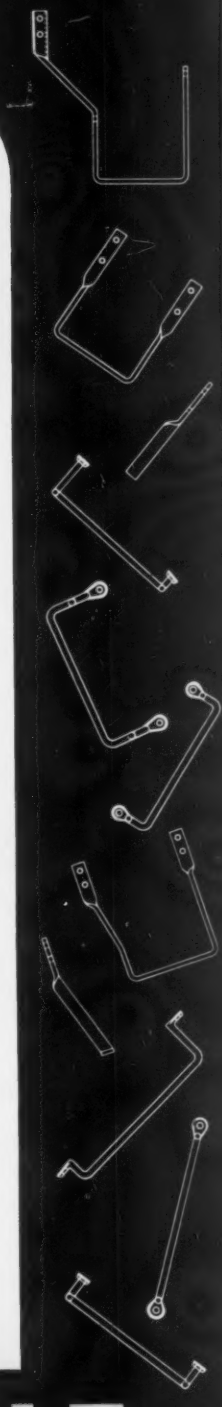
The left control station in the plow cab, which controls the plow's rotor, has throttle and reverse handles, control switches, alarm buzzer and call push button for the rotor power unit. There is also a ground relay, overspeed lights, and air valves for raising or lowering the rail scraper and blade plow between the trucks.

A tachometer indicates rotor speed, and ammeters measure current carried by the driving motors. Two 716 motors at each side of the plow body drive idler shafts which, in turn, are geared to the main rotor shaft. Normal full speed is 120 rpm; maximum safe speed, 150 rpm. The rotor speed depends on the load and throttle position. An overspeed protection circuit unloads the rotor power unit when the rotor speed reaches 140 rpm, reducing the engine speed and lighting a yellow overspeed light on the rotor control stand. The rotor throttle is then reduced to idle. When the overspeed light goes out, the throttle may be opened again. The operator is

(Continued on page 82)

Three-unit combination—the plow, a B-unit supplying rotor power, and an A-unit for propulsion —can be supplemented by added units if more pushing power is needed.





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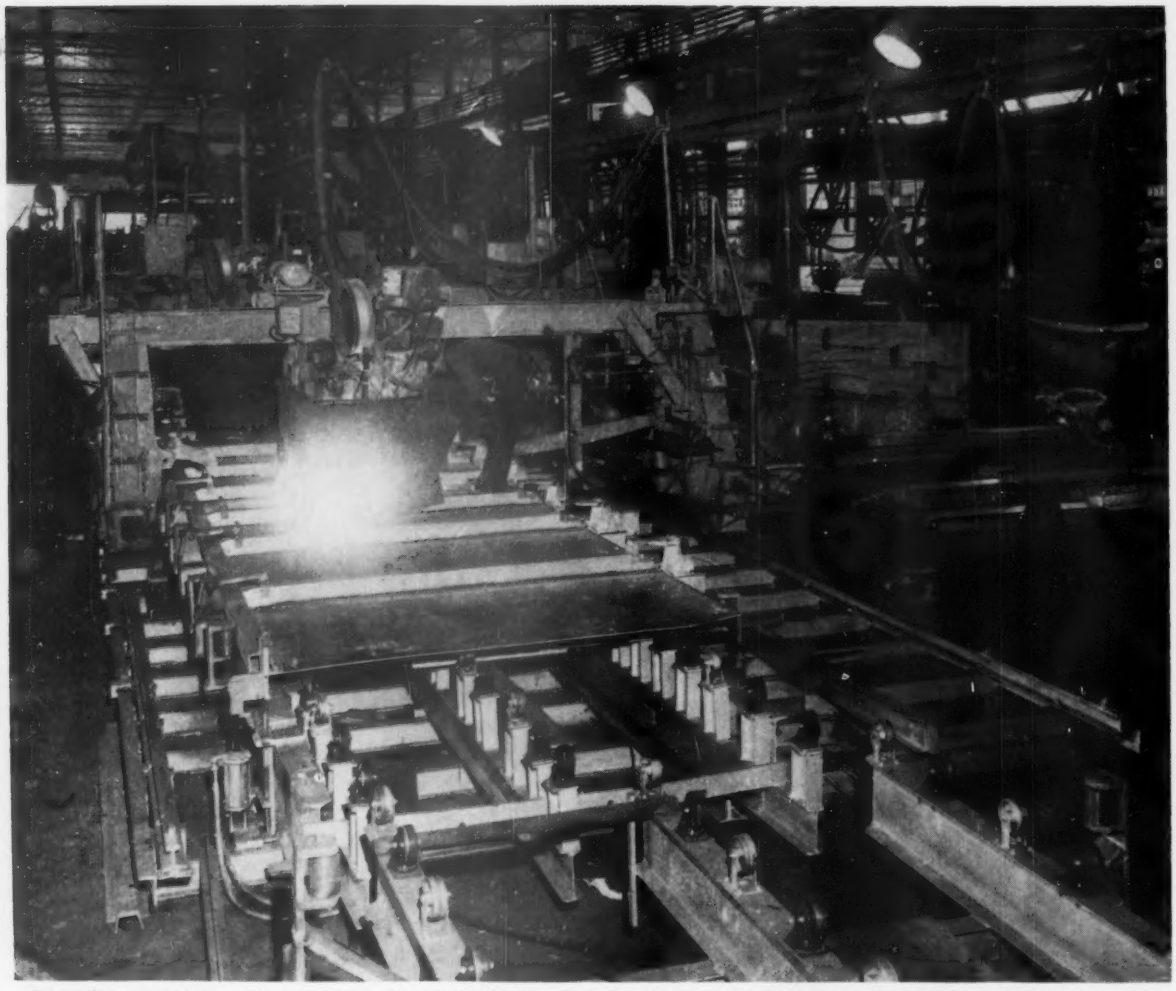


Side stakes are welded to side sheet for one of the 750 aluminum gondolas. Up to six MIG welding heads could be operated simultaneously.

Solving Aluminum Welding Problems

Tooling of Bessemer plant for production of Southern order required application of new welding techniques

By George W. Frehafer

Setting up a production line to build 750 aluminum gondolas was not a routine operation even for the Pullman-Standard plant at Bessemer, Ala. (RL&C, April 1960, page 27). It's not strange that car plant personnel and W. G. Boese, chief welding engineer for Pullman-Standard, were a bit concerned at first. Welding might be considered the key to the entire operation, and there was much to consider.

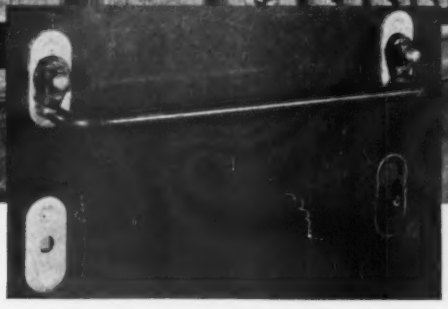
Behind these 750 aluminum gondolas and 455 aluminum covered hoppers ordered from Magor Car Corp. (RL&C, June 1960, page 28) was three years of intensive development work by Reynolds Metals Co., the aluminum supplier, and the Southern which ordered all 1,205 cars. Working closely together, the Pullman-Standard plant team headed by Works Manager J. E. Bolen and the welding specialists headed by Mr. Boese had to make decisions on jigs, fixtures, welding procedures, welding equipment, electrodes, and fabrication sequences. At the P-S welding laboratory in Michigan City, Ind., Mr. Boese's assistant, B. Karnisky, along with technicians G. Weaver, W. Wenc, and A. Lyder, joined in working out equipment problems. In evaluating existing semi-automatic welding equipment it was decided to use Air Reduction and Linde products. Adequate quantities could be delivered in time; and servicing and instruction were assured.

To assure smoothness of operation and permit the use of large diameter electrodes, Pullman-Standard personnel built an automatic welding unit utilizing Lincoln LAF 2 and LAF 3

(Continued on page 44)

Mr. Frehafer is project director, Reynolds Metals Co., Richmond, Va.

FOR STEEL-LINED CARS, REEFERS,
INSULATED CARS AND SPECIALS,
GT WASHERS ARE A NECESSITY, BUT...



your shop and maintenance men deserve GT WASHERS on every car

It's a waste of time, energy and money to pull a car out of the line and remove lading and lining to repair a loose or damaged grab-iron or ladder!

GT washers allow you to make all repairs from outside the car; you don't disturb the *lading*, you don't disturb the *lining!*

Don't waste future time and money—build or renew with GT washers.

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IN CANADA: THE HOLDEN CO., LTD., MONTREAL

Sawing of aluminum sections simplified fabrication; here inside braces are being prepared.

Side sill and side plate are being joined by the automatic MIG (metal inert gas) welding.

welding heads and controls, with additional controls for gas and water. An Airco wire reel was adapted to this unit; special drive rolls were made. The device can drive large diameter electrodes with instantaneous response and positive control with extremely smooth operation. It was decided to use motor generators instead of transformers or rectifiers, because the generators were considered less sensitive to power line fluctuations.

The selection of electrode alloy provided some interesting problems. One group of engineers suggested 5356 electrode because of the resulting high strength with good ductility. Another group backed 5556 electrode which has a 2,000 psi higher ultimate strength and 1,000 psi higher yield. With a 5083 H113 base, the first group reported, the 5356 filler gave a 42,000 psi ultimate, a 21,000 psi yield, and a 2-in. elongation of 16 per cent. With a 5456 H321 base, the 5556 filler gave 44,000 psi ultimate, a 22,000 psi yield, and a 2-in. elongation of 8 to 10 per cent.

Ordinarily, this small elongation would suggest a decrease in ductility which would raise questions concerning fatigue life and impact resistance, but the satisfactory performance by overmatching was the deciding factor.

This information proved true in testing at Michigan City, but it was also found that, using 5556 electrode to overmatch the 5083 H113 base, the following results were obtained: 44,000 psi ultimate, 22,000 psi yield, and 18 to 25 per cent elongation 2 in. Overmatching the base plate caused the base plate to yield rather than the weld, and the elongation obtained was a welcome condition.

In order to obtain an electrode surface finish which had proved successful on many critical fabrications in the past, Reynolds engineers suggested that the electrode meet MIL E 16053 G specifications. Because shelf life was no problem and all the electrode would be consumed, a zincate finish was specified. Most of the electrode was finished, wound and packaged by the Morgan Aluminum Co.

For tacking and out-of-position welding and repair, $\frac{1}{16}$-in. diameter electrode was used, usually with semi-automatic air-cooled equipment. For sub-assembly welding and non-automatic welding using semi-automatic water-cooled equipment, $\frac{3}{32}$-in. electrode was used. The $\frac{1}{8}$-in. electrode was used in automatic welding. This was the largest commercially available electrode; to establish manufacturing procedures for larger sizes would take too long.

This last aspect will be further investigated at Michigan City to establish welding conditions using $\frac{3}{16}$-in., $\frac{9}{32}$-in., and $\frac{1}{4}$-in. electrodes at some later date using the modified equipment. It is also planned to investigate the use of tandem heads to increase welding speeds as is done in steel.

Conditions established for welding were as follows:

- $\frac{1}{16}$-in. diameter 5556 electrode —180 to 240 amp at 26 to 27 volts, depending on position and side of tack or weld bead;
- $\frac{3}{32}$-in. diameter 5556 electrode —310 to 325 amp at 28-29 volts;
- $\frac{1}{8}$-in. diameter 5556 electrode —400 to 425 amp at 25-26 volts.

Speeds were 14 to 31 in. per min, depending on fillet size and location. All automatic welding was done in downhand position.

The intention at Birmingham was to build the sample car using automatic welding where designated and semi-automatic for the balance of the car. Due to difficulties in obtaining parts in time for the automatic units, the sample car was welded entirely with semi-automatic equipment. While this sample car was being completed and accepted, the automatic fixtures and equipment were being located, tested and installed on the production line.

One major problem became apparent when tacking jigs for the ends of the cars were built. Spacing between hat sections was critical in order to be welded automatically. A $\frac{5}{16}$-in. opening between sections had to be maintained, and center-to-center spacing of 7.668 in. held. The tacked end was to be passed under a gantry containing 13 fixed automatic welding heads, with positions of these heads based on the above center-to-center distances. Commercial tolerances of the extrusion were plus or minus .168 in., which were thought to be too much for this jig. The jig, however, performed satisfactorily on test.

Sub-assemblies and production problems were worked out while the production line was being established, and on January 5, 1960, work was started to fill all positions and start up the line. Fourteen days later, a total of 22 cars had come off the line and the forty-second car started through. Ten days later, full production of 16 cars per day was reached.

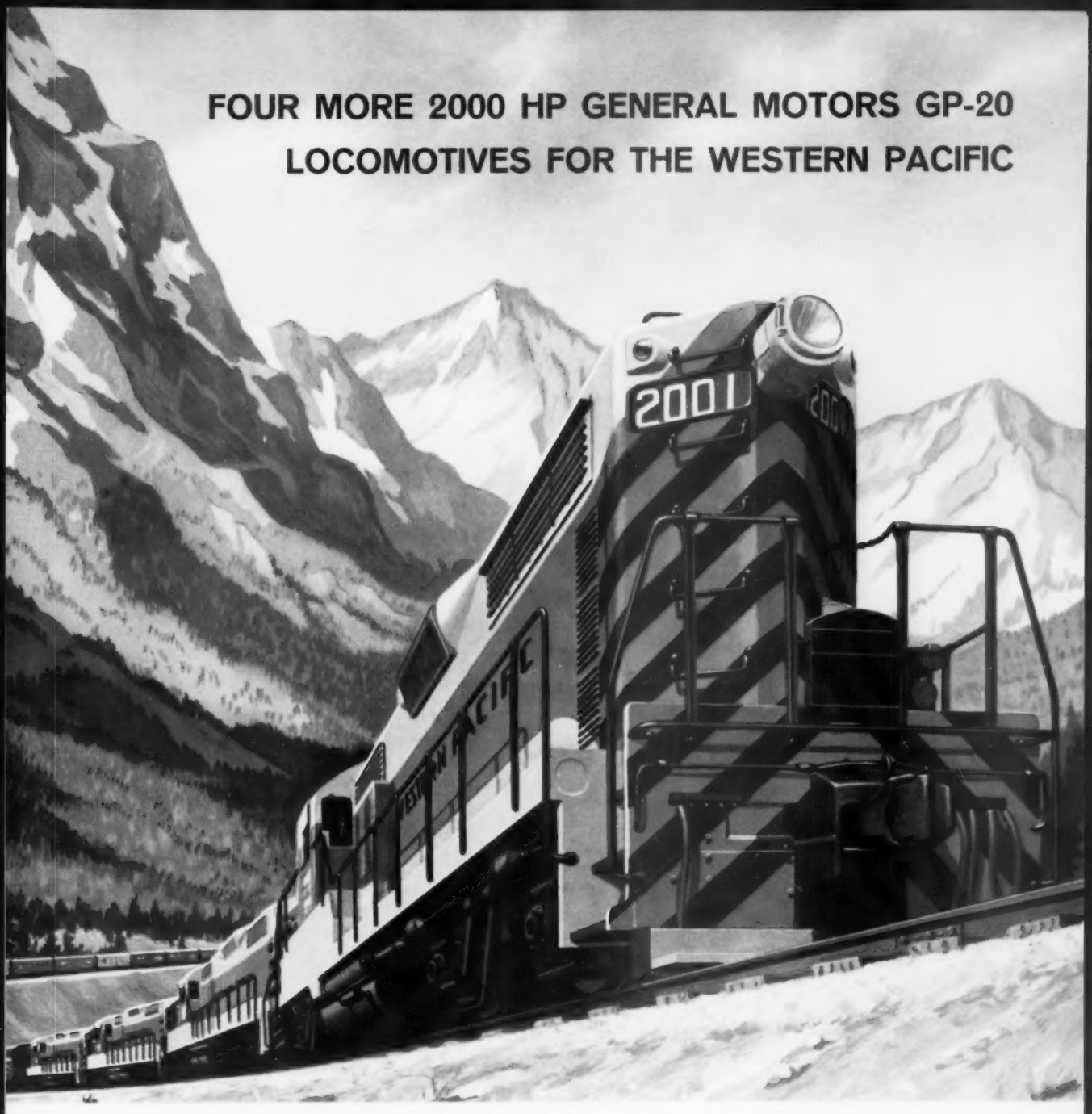
With so large a number of men who had never worked with aluminum welding before, there was considerable skepticism at first. But as they gained experience, the welders' whole attitude changed as they realized they had become competent aluminum welders.

Welding speeds of semi-automatic aluminum welding initially proved to be about the same as on steel. Increased familiarization with equipment and use of 20-lb spools of electrode decreased down time. Automatic welding was completed at half the speed of steel welding at first. This was corrected by using additional heads to bring speed back in line with tandem-head automatic steel welding. Going to 30-lb spools decreased down time.

Workmen found fit-up on this car to be easier than that of a steel car, primarily because components in aluminum are saw-cut and close tolerances can be maintained. Low modulus of elasticity permitted easier and

(Continued on page 56)

FOUR MORE 2000 HP GENERAL MOTORS GP-20 LOCOMOTIVES FOR THE WESTERN PACIFIC



WP adds more power with Electro-Motive Locomotive Replacement Plan

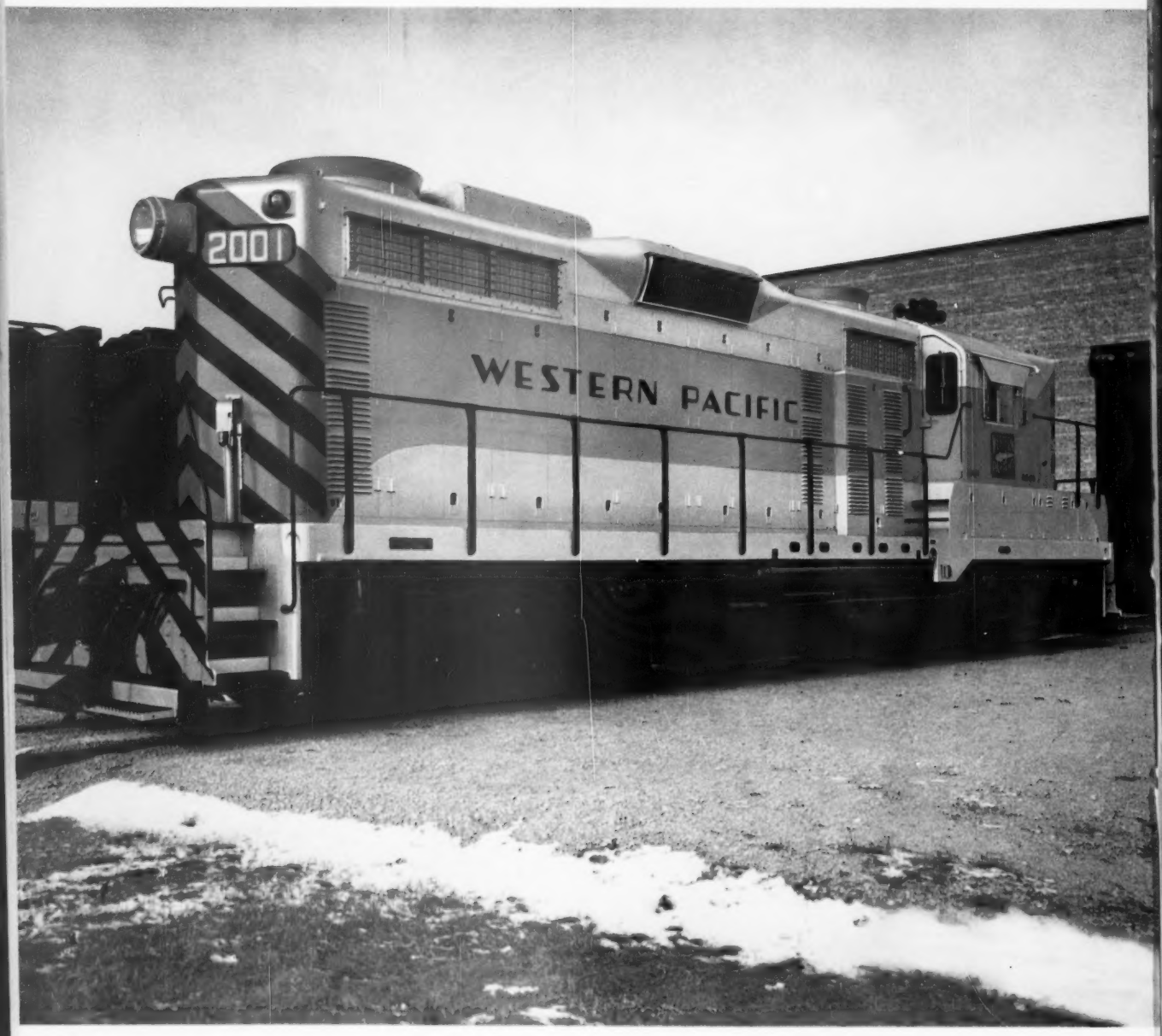
In November 1959, the Western Pacific took delivery of six new General Motors GP-20 locomotives. The success of these powerful Diesels (permitting faster scheduling, heavier hauls, unit elimination) prompted the Western Pacific to embark on a program to replace older freight type locomotives with GP-20's.

The WP is acquiring the new power under Electro-Motive's Locomotive Replacement Plan. Four FT freight locomotives originally delivered during World War II have already been turned in to Electro-Motive on the purchase of four GP-20 locomotives.

Why is the WP buying new power this way? Cost is one reason. The new units are purchased at much lower capital investment because of the turn-in value of the old locomotive. Another reason is the higher horsepower of the new unit. *Three* GP-20's will do the work of *four* of the old locomotives. Greater versatility, lower fuel consumption and reduced maintenance are other reasons.

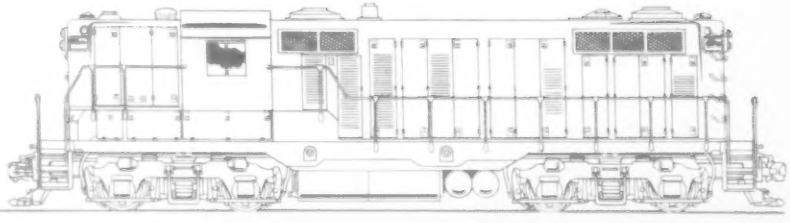
Can these savings and advantages be applied to your road? Ask your Electro-Motive representative.

For more details on the GP-20, turn page . . .



2000 HP GP-20 locomotive, one of six such units delivered to the Western Pacific in November, 1959. Four additional units delivered in July 1960, under Electro-Motive's Locomotive Replacement plan, are identical in appearance and all operating characteristics.

The GP-20 is nearly identical in size with past GP models. It measures 15′ high, 56′ long, coupler to coupler. Width is 10′.



Power is up, maintenance and fuel costs are down . . .

The GP-20:
a locomotive to revise all measurements of general purpose performance

The new GP-20 is a 2000 hp general purpose locomotive unit with four-wheel trucks. In appearance, it resembles past GP's but there the similarity ends. The increased capacity of its new prime mover, transmission and related systems has set new standards of performance.

For example:

Faster runs, more tonnage, greater versatility. The 2000 hp GP-20 has all the flexibility of predecessor GP's but with more capacity for heavy tonnage, high-speed freight service. In multi-unit consists, it will speed up present schedules, or handle more tonnage at established speeds. For many trains, the GP-20 will mean cost-saving unit elimination.

Lower fuel consumption. The new 567D-2 engine actually produces more power on a smaller diet than the famous "C" engine. The Electro-Motive designed Turbo-charger and new needle valve injector combine to reduce specific fuel consumption by as much as ten percent. The Turbo-charger is also responsible for maintaining rated engine power in higher altitude operation (up to 8000-foot altitude). With the GP-20, full-working power is maintained throughout a wide range of operating altitudes.

60% reduction in scheduled maintenance. More than thirty new maintenance reduction items are basic on the GP-20. Scheduled maintenance requirements have been lowered by 60 percent. In addition, the GP-20 contains material and design improvements in major components that measurably improve their durability and operating life.

Among the many improvements in the GP-20 is a new main generator with a 50 percent greater service life than previous generators, a new electro-magnetic control cabinet that completely eliminates scheduled maintenance, and a new high speed wheel slip control that protects traction motor components against damage from motor overspeed.

For specific details on the GP-20, contact your Electro-Motive representative.

ELECTRO-MOTIVE DIVISION
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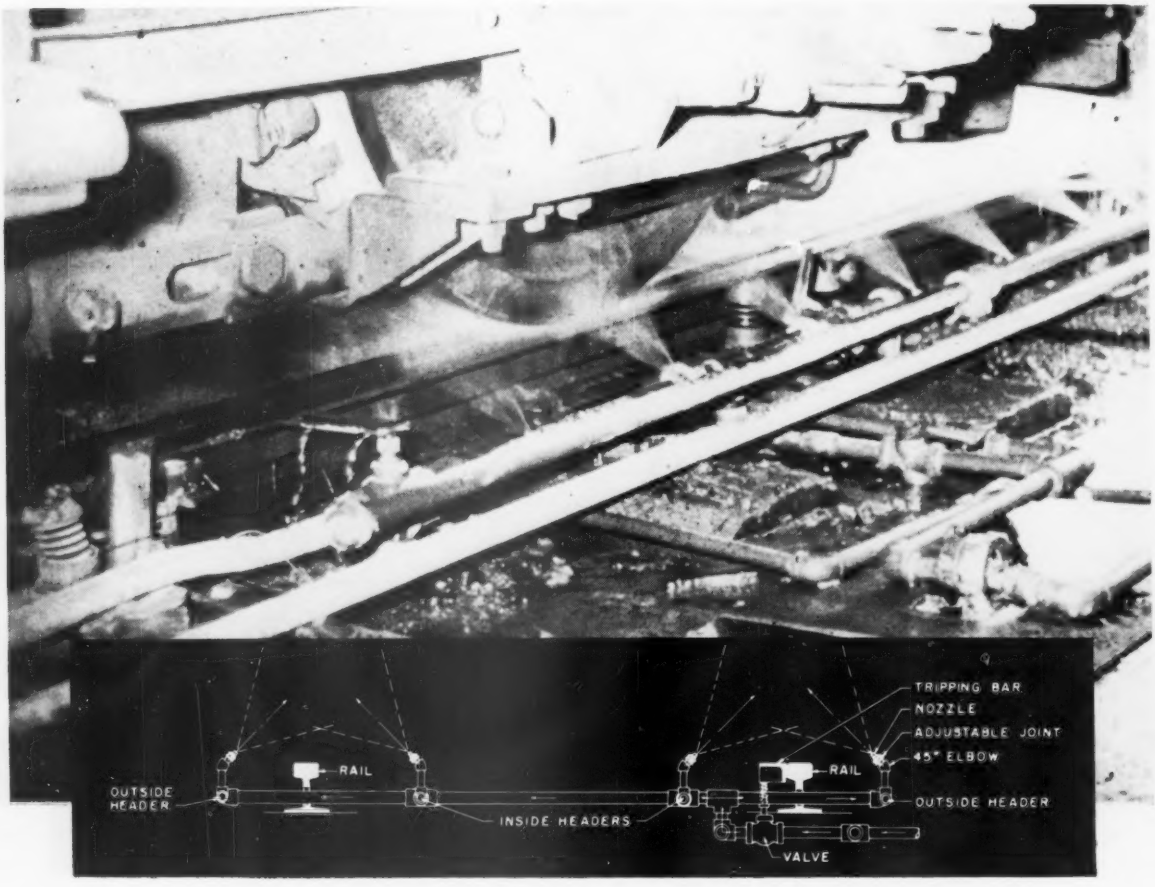

...simple setup cleans diesel wheels automatically

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OAKITE

SCIENCE

over 50 *Est. 1909*

years' leadership in industrial cleaning

Increasing Service Life of Wheels

By A. M. Johnsen and F. R. Dorner

Wear and service damage limit wheel life on cars and locomotives. Generally, wear is the ultimate limit. Service damaged wheels, however, must frequently be removed long before normal wear would make this necessary. In one test, wheels removed for thermal cracks came out when they had an average of only half the mileage of wheels which reached wear limits in the same service.

Frequently more metal must be removed to correct service damage than is necessary to restore proper contour on wheels which have worn to their dimensional limits. In addition, service damage can be the source of complete wheel failures. Thermal cracks, and even shelling, can be sources of complete failures when wheels become highly stressed during heavy or sustained braking.

While thermal cracks, shelling and slid flats are the principal types of service damage—consequently the primary reasons for reduced wheel life—there are a number of factors which increase actual wheel wear.

Thermal cracks result from heat generated by braking. Total heating and rate of heat generation are important. For these reasons, braking horsepower is used as an approximate measure of conditions which can result in thermal cracking.

Carbon content of wrought-steel wheels is the primary metallurgical factor in thermal cracking. Effect of carbon content is so important that properties of other chemical elements may be disregarded. The lower its carbon content, the more resistant a wheel is to initiation and growth of thermal cracks. Low carbon wheels, even in severe service, often do not develop condemnable thermal cracks before a wear limit is reached.

Service Severity

The graph shows how carbon relates to service conditions. It is also useful in determining the frequency of thermal cracking removals to be expected from wheels of different carbon contents. Knowing the performance of any group of wheels in service, expected performance of other wheels can be estimated. The effects of changes in service conditions can also be determined.

Residual stress is another metallurgical factor affecting growth of thermal cracks. As manufactured, wheels are stressed to resist growth of thermal cracks. With repeated braking, this favorable stress decreases progressively.

Amount, duration and frequency of braking are important. Faster and heavier trains are more likely to experience thermal cracking with a given braking condition. While weight of equipment cannot be varied significantly, control of speed can reduce thermal cracking considerably. Roads have found that speed limits of 80 mph improve wheel performance without impairing schedules. Limits of 100 mph usually require more frequent braking and kinetic energies involved are almost twice those involved with 80 mph top speeds.

One railroad checked braking on two trains over a 75-mi. run which involved a number of speed restrictions. The first train observed a 90-mph speed limit; the second was permitted speeds to 110 mph. Running times were identical; 30 brake applications were made on the first train, 120 on the second.

Brief, heavy brake applications at high speeds develop high temperatures in a shallow layer of tread metal. These temperatures are reduced rapidly by the cold rim when brakes are released. Frequent repetitions can intensify thermal cracking. It is generally advisable to use lighter, prolonged brake applications.

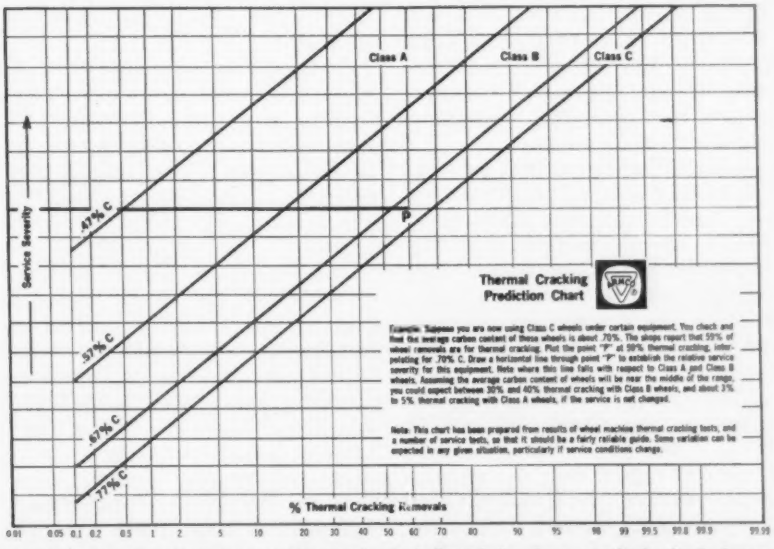
Dynamic braking lessens thermal cracking by reducing braking on the wheels. In fact, dynamic brakes often prevent thermal cracks entirely.

Under-braking locomotives reduces thermal cracking on locomotive wheels. Any resultant increase in braking on freight cars is insignificant because it is spread over a large number of wheels. In passenger trains, with fewer wheels, increased braking on cars can be counteracted by using low-carbon wheels. Each case must be judged individually.

Tread-type brake shoes minimize thermal cracking. Flange-guided shoes, when worn, can bear upon the top of the flange, producing thermal cracks there. Both flange and tread type shoes can produce thermal cracks at the outer edge of the tread if permitted to overhang. These thermal cracks are more deceptive than those in the tread for two reasons:

- Concentrated heat will produce thermal cracks under braking condi-

Mr. Johnsen is supervising research engineer, and F. R. Dorner, engineer, Armco Steel Corp.


Class A
Class B
Class C
Service Severity
.47% C
.57% C
.67% C
.77% C
P
Thermal Cracking Prediction Chart
% Thermal Cracking Removals
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

Relation of carbon content to service severity is indicated for three standard wheel classes.

tions that would not normally cause such cracks on the tread.

• Cracks of a given surface length will be two to three times as deep as comparable tread cracks.

These rim edge cracks are most likely to cause excessive loss of service metal and lead to wheel failure. Wheels with thermal cracks in these areas should be removed as soon as the condition is detected.

Regular shoes should be held so they will not overhang the outside edge of the tread. This sometimes requires guides or tie bars between brake hangers on opposite sides of a locomotive unit. Shoes should be removed before wheels contact the steel backing of the shoe, because steel produces higher frictional temperatures than cast iron. Inspection of used brake shoes helps catch misalignment and assures shoes will be removed in time.

If locomotive brake rigging requires flange-guided shoes, there should be frequent inspections to check for thermal cracks and proper shoe alignment. In recent years, a very high percentage of thermal crack failures have occurred on switcher wheels when flange-guided shoes were used. These units require special attention.

Sometimes wheel truing or abrasive brake shoes are used on switchers to restore tread and flange contours, or to remove small flat spots. These brake shoes can readily produce thermal cracks and should be used carefully.

All wheels should share braking equally to minimize severe localized braking and needless thermal cracking. Speed governor controls should function properly; brake lines and cylinders should be clean, and shoe travel should be so adjusted that brakes engage simultaneously. Excessive thermal cracking and serious failures have resulted when locomotive hand brakes have not released.

When moving locomotive units dead in trains, special instructions in the locomotive manuals should be followed to prevent accidental brake application. Some locomotives have developed cracked or severely overheated wheels during such movements. Overheated wheels are so stressed that, if a thermal crack develops, the wheel may break immediately. Whenever there is evidence of overheating, wheels should be scrapped.

When switchers handle longer cuts of unbraked cars, braking becomes increasingly demanding. To speed such operations, the tendency is to brake more heavily, and thermal cracking can become a problem. One way to alleviate this is to use a ballasted auxiliary car with the locomotive for additional braking effort.

Shelling

Essentially, shelling is tread fatigue induced by repeated stresses caused by the load between wheel and rail. Maximum shear stresses caused by these loads are located at a point beneath the tread surface so that cracks start beneath the tread and grow in both directions. Forces that produce shelling come primarily from weight of equipment. However, dynamic forces join with these static forces to increase the resulting stress.

A condition similar to shelling is frequently found in locomotive wheels. It is spalling of metal between small, closely spaced thermal cracks. Factors involved are primarily those described under thermal cracking, except that fine thermal cracks leading to spalling may be due to heating of slipping wheels rather than to brake-shoe friction. Lower carbon wheels are more resistant to spalling, but less resistant to shelling.

Strength or hardness of metal at and under the wheel tread is the metallurgical factor important in shelling. The stronger the metal, the less likelihood of shelling. Strength, in turn, is influenced by heat treatment and chemical composition, particularly carbon content. Heat-treated wheels are harder than untreated wheels. Wheels of higher carbon content are harder than those of lower carbon. Influence of carbon content in shelling is opposite to its effect on thermal cracking. Thus, when both thermal cracking and shelling are excessive, service conditions and maintenance are of increased importance.

Service factors in shelling are much like those involved in thermal cracking and have much the same effects. Higher speeds increase shelling. Heavier equipment has the same effect. Increased braking increases shelling. However, the reasons are somewhat different from those for thermal cracking.

Higher speeds increase shelling primarily because wheels are pounded more at rail joints and crossovers, producing higher stresses. Braking, when sustained, produces temperatures over 600 F, causing wheel metal strength to drop. Considerable braking when a train is running aggravates shelling, other factors being equal.

Maintenance which minimizes braking intensity helps minimize shelling by preventing excessive heating. Maintenance of track and roadbed are also important. Large offsets at rail joints and lack of resiliency in the roadbed mean greater pounding. For example, freezing of ballast aggravates shelling.

Heavier equipment naturally creates greater forces between wheel and rail, increasing shelling stresses. This should be taken into consideration when designing new equipment, using data on shelling stresses in the *AISI Steel Products Manual on Wrought Steel Wheels*. Bearing forces can be decreased by using wheels of a larger diameter or by increasing the number of wheels. With higher operating speeds, wheel loads should be lower. Where loads must be high, such as on locomotives, it is possible to reduce stresses by doing more of the braking on the train.

Slid flats damage rails and represent economic losses in terms of wheel service metal, schedule interruptions, and reduced availability of equipment. These flats occur when braking friction exceeds rail adhesion, so that wheels stop.

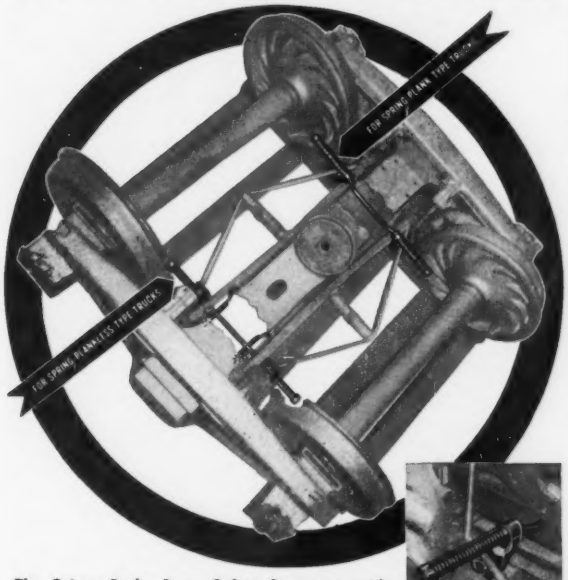
To prevent slid flats, braking friction must not exceed rail adhesion. These factors vary with time and conditions. Anti-slide devices are good safeguards, but where these cannot be used or are not economical, other controls are needed. Another approach could be improvement in rail adhesion by sanding, cleaning, or chemical conditioning. While primarily for traction, incidence of flat spots could be reduced.

There are no metallurgical factors in slid flats except as they might affect spalling in a non-condemnable flat spot. A low-carbon wheel is more resistant so spalling. This is important in connection with chain sliding of wheels with off-tread brakes. Early spalling sometimes results when Class C wheels are used. Class A or Class B wheels may permit higher mileage if removals are excessive because of spalling due to chain sliding.

Braking procedures and maintenance of brake parts are factors in slid flats. Brake friction of cast-iron shoes increases as speed decreases. This requires compensation during a stop. Small reductions in allowable cylinder pressures can often reduce incidence

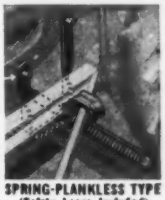
(Continued on page 74)

THE IMPROVED GRIPCO
BRAKE BEAM SAFETY SUPPORT



SPRING-PLANK TYPE

The Gripco Brake Beam Safety Support provides the greatest safety at lowest cost. Its dependability has been proven over years of actual service. Gripco Safety Supports are low in original cost, low in application cost and low in maintenance cost, even after years of service.



SPRING-PLANKLESS TYPE
(Safety Loops Included)

ENGINEERING IMPROVEMENTS

1. One design fits both 5'-6" and 5'-8" wheel base trucks.
2. One rod length and one spring length. One interchangeable casting fits both spring plank and spring plankless trucks.
3. Ideal for interchange repairs. New design permits easy and fast applications under all conditions. Nuts need not be removed to apply or remove the support.

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2. Designed for spring plank and spring plankless trucks. Spring plankless trucks require safety loops which can be bolted, riveted or welded to the bolster.
3. Supports the brake beam in the event of brake beam or hanger failure.
4. Holds brake beam in horizontal position.
5. Holds brake shoe in proper position in relation to the periphery of the wheel.
6. The brake release feature pulls brake shoes away from wheel contact instantly when brakes are released.
7. Prevents unnecessary wheel and shoe wear caused by dragging brake shoes.
8. GRIPCO supports can be removed and reapplied without removing nuts; therefore nuts are furnished in proper position.
9. Brake beams, rods, and levers are held in position under spring tension thus reducing false movements, chattering and wear of hangers, hanger pins and brake heads.
10. Can replace as a billable repair any support except A.A.R. recommended practice (angle-riveted and welded).

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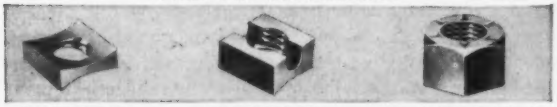
OTHER GRIP NUT PRODUCTS AD NO. 110



Grip Lock Nut #1 Grip Holding Nut #2 Railroad Gripco Lock Nut #3

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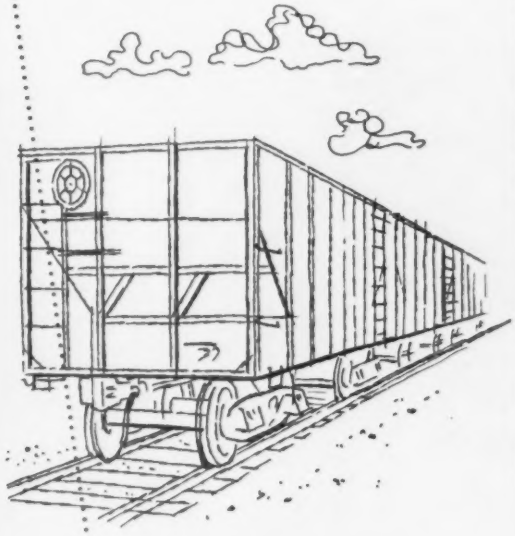

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Established 1868

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Transportation Products Division
Cleveland 6, Ohio

Power tools can be used for the installation of high-tensile bolts. Here bolts are being used in the assembly of freight car underframe.

H-T Bolting Used for Car Repairs

A fastening technique borrowed from the construction industry promises to be increasingly popular in car rebuilding and repair. High-tensile bolting, a method developed to help steel erectors speed building construction and lower costs, is attracting attention as a fastener for use on rolling stock.

Previously used by railroads for bridge and structural work, high-tensile bolting is now finding applications in problem areas such as hopper-car top chords and side stakes, in strikers, center sills, bolsters, draft-gear carrier irons, and safety appliances.

Under consideration by the AAR Mechanical Division's Commitee on Car Construction, high-strength bolting is relatively new on the industrial scene. In five years, it has become the most popular fastening method in steel construction. More than 80 per cent of today's field connections are made this way; fabricators' shops are adopting it. R. B. Belford, technical advisor to the Industrial Fastener Institute, has stated. "It's doubtful if any single advance in the long history of structural engineering has so fired the imagination of engineers as has the high-strength bolt."

High-tensile bolts clamp parts together so tightly that loads are carried from member to member by friction rather than by shear and bearing. These bolts can be used wherever rivets or machine bolts are utilized. Approval of the high-strength bolt for joining structural members has come from the American Institute of Steel Construction, American Railway Engineering Association, and Industrial Fastener Institute.

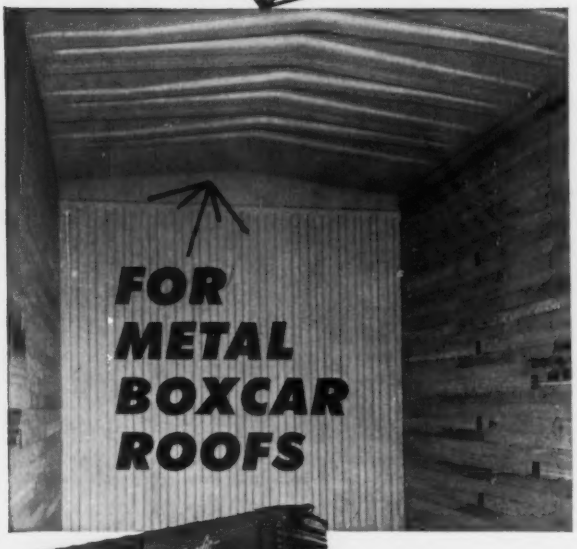
High-tensile bolts are made of quenched and tempered medium carbon steel to ASTM Specification A-235. They are used with a hardened flat washer to distribute the clamping force over a greater area and are held by high-strength, double-chamfer, heavy pattern nuts. The bolt is identified by three radial lines on its head. There are similar markings on the face of the nut.

According to Russell, Burdsall & Ward Bolt & Nut Co., a pioneer in the application of the high-strength bolt to railroad fastening problems, the technique should reduce construction and maintenance costs. For the past three years, RB&W engineers have worked closely with railroad mechanical departments to test the practicability and economy of utilizing the high-strength bolt in car shops.

In a gondola repair requiring only 69 bolts, a saving of $13.78 in labor per car was reported, and the repair crew was reduced from ten men to four without slowing output. Although material costs increased $11.40, a net saving of $2.30 was realized. During the application of bulkheads in gondolas for steel-coil loading, high-tensile bolts were used to fasten a beam on the top rail and brackets on the side at

(Continued on page 54)

Frost's *Insulcote!*



UNION PACIFIC IS ONE OF MANY USERS OF FROST'S INSULCOTE

Here's the practical, economical way to prevent sweat damage to lading...

● Now it is possible to apply a quick, economical coating to metal boxcar roofs that will assure a permanently dry surface.

Insulcote, an emulsion-type plastic coating for metal boxcar roofs, actually *absorbs* moisture preventing condensation that can result in sweat damage.

Insulcote bonds to galvanized metal surfaces under any conditions . . . without preliminary acid treatment of surface. It is not affected by mineral solvents and fumes.

Another big advantage of Insulcote is ease of application. One man can undercoat the roof of a 40-foot boxcar in less than 15 minutes. Insulcote can be applied with heavy-duty spray gun equipment. It is safe and clean . . . and presents no fire hazard.

Available in 5-gallon steel pails and 55-gallon open-head steel drums. Write for free booklet.

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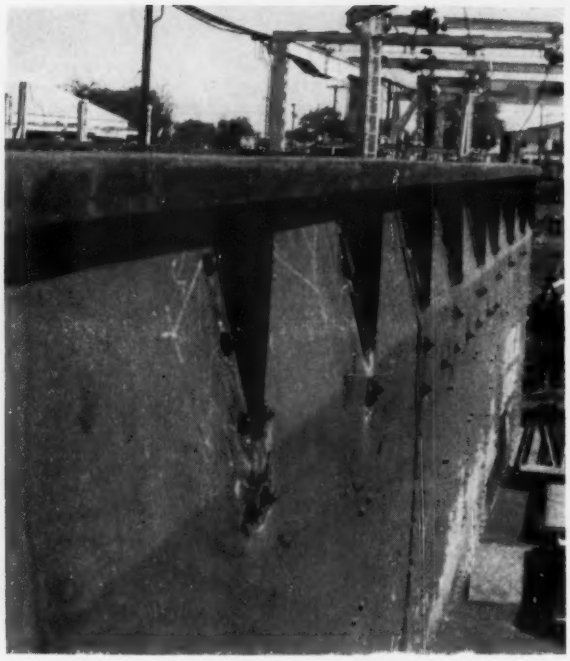
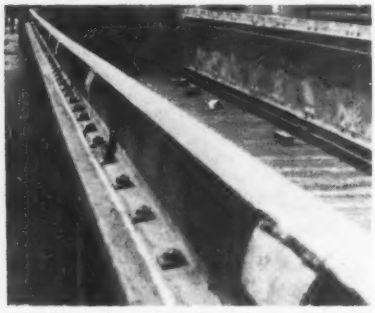
Power wrenches or hand-operated torque wrenches can be used for applying bolts. Both were used in course of this hopper repair program.



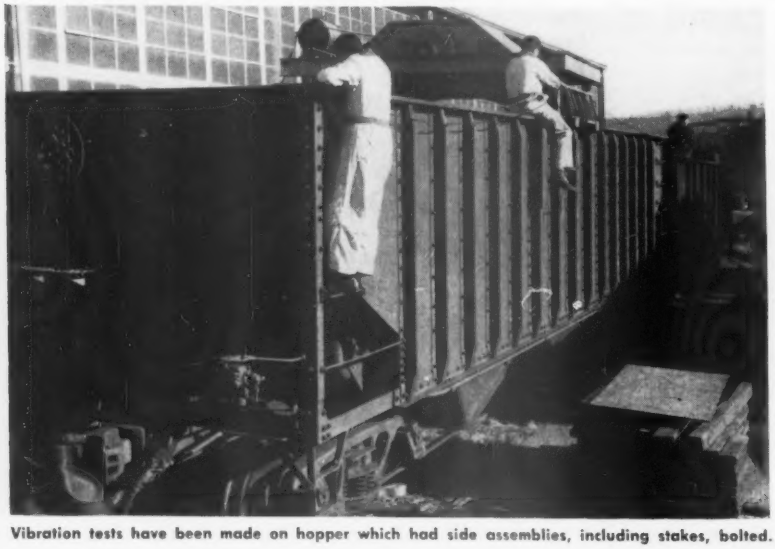
Partially bolted car structures have been subjected to vibration tests after rebuilding. Tests have shown bolts to be effective.



Rebuilding of gondolas for coil car service was expedited when railroad used h-t bolts in application of beams to the top angles.

an assembly time saving in excess of 50 per cent.

For vibration tests on a 70-ton hopper car, the top chord, center sill and center-sill cover, rear stops, draft-gear carriers, and air reservoir were applied with high-tensile bolts. The empty car was subjected to a 3-hr test with a car shaker. Tests were stopped when it was found that the shaker was tearing the car apart while none of the bolts had loosened. On another road, a 70-ton hopper was rebuilt with half the underframe bolted and the other half riveted. Following successful impact and shakeout tests, the car was put into service. After six months, it was returned to the shop for inspection. Many rivets had worked loose, but the high-tensile bolts were still secure.



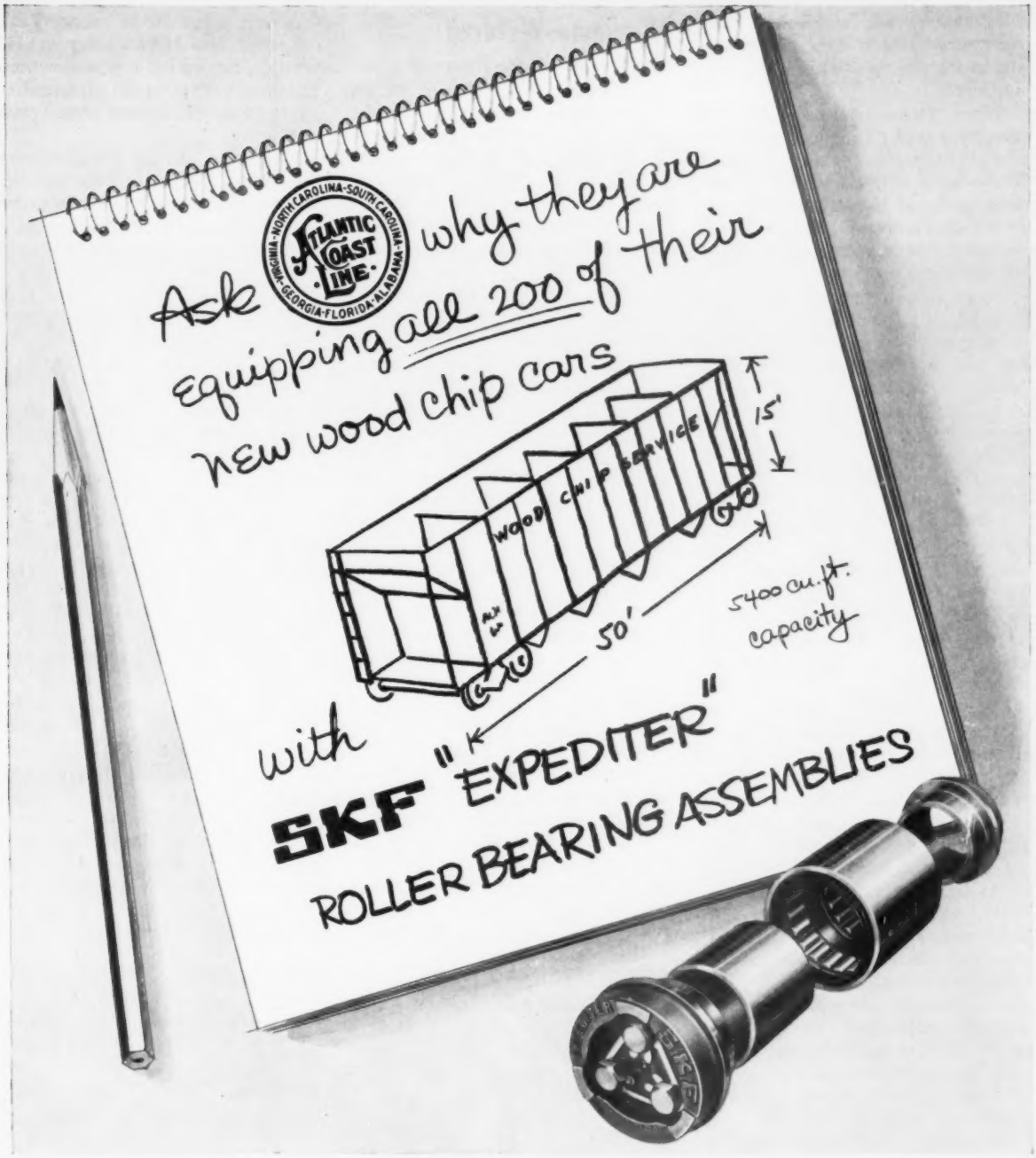
Vibration tests have been made on hopper which had side assemblies, including stakes, bolted.

Underframe Uses

In the cushioned underframe of heavy mechanical refrigerator cars, bolts were substituted for rivets holding the stops to the center sill and have since withstood the shearing action of heavy switching. A two-man bolting crew in a railroad car shop fastened 76 connections in miscellaneous joints on new car underframes in 30 min, replacing a three-man riveting crew which needed 40 min for the job. Bolting was faster than riveting despite the fact that four different sizes of bolts were used.

In rebuilding 70-ton ore cars used in conjunction with car shakers, ½- x 3½- x 5-in. top rails, along with side reinforcements and inside stiffeners, were fastened with rivets. They needed repairs in 7 to 19 months. Rivets holding side sheets and braces were sheared and torn out, causing cracks to develop around the rivet holes, which had to be repaired by welding. Other difficulties were experienced with re-

(Continued on page 56)


Ask Atlantic Coast Line why they are equipping all 200 of their new wood chip cars
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WOOD CHIP SERVICE
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50'
5400 cu. ft. capacity
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Probable answer: "—because roller bearings offer a large maintenance savings while eliminating costly line of road delays and accidents. And they're built to provide maximum service even under the most rugged operating conditions."

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tainer valves and reservoirs. Bolts were substituted in these connections and have given highly satisfactory service since.

When conventional bolts and lock nuts were used to apply reservoirs to new 50-ft box cars, they began to loosen after only six weeks' service. Substitution of high-tensile bolts corrected the problem. Similar results were obtained on pedestal tie straps on passenger-car trucks.

Rivets develop their clamping force from shrinkage on cooling. Because most rivets used in car construction are of relatively short grip length, clamping forces are not large. Because rivet tension does not reliably improve shear strength of a riveted joint, shear strength of the rivet, itself, is the only real resistence to shearing.

In producing a controlled clamping force with fastener tension, the magnitude of this force and the uniformity with which it can be achieved and maintained are both important. Through control of the tightening of bolts, uniform clamping forces of high magnitude can be obtained—11 tons for ⅝-in. bolts, 16 tons for ¾-in., and 21 tons for ⅞-in. bolts. Tension in riveted joints using the same rivet diameters could reach only half of these values, according to RB&W engineers.

While it is important to properly tighten high-strength bolts, it is a simple operation and can be accomplished either by hand or power wrenches. Power wrenches have proved most satisfactory and economical tools and are used wherever possible. Power wrenches are usually of the air impact type, although an electric impact wrench is satisfactory for the smaller bolts. Manual wrenching is usually confined to jobs where few bolts are to be used or where electric power or compressed air is not available.

With the ability to develop uniform clamping forces, high-tensile bolts can be used to pull several layers of material together. In similar situations, using rivets, it would be almost impossible to draw the sheets together with rivets alone. It is also possible with the total clamping force applied by high-tensile bolts to pull parts together to retighten, if necessary, and so develop uniform prestress in the bolts. This is not the case with rivets, short of burning out and riveting to overcome the loosening which frequently develops by the driving of successive rivets in a connection.

Aluminum Welding

(Continued from page 44)

more rapid fit-up even using warped sections without intermediate straightening operations. Warpage of aluminum, when welded, proved to be comparable to that in steel assemblies. Overall dimensions were maintained during welding, while comparable steel sections would shrink as much as ¼ in.

Component fabrication costs in aluminum were decreased as compared with steel because of cold forging and forming. Items such as bottom bolster plates, formed hot in steel with extra handling and heating expense, are cold-formed or cold forged in aluminum with less handling. Increased production of some parts was due to the lighter weight of components, and increased ease in handling. Automatic constricted-arc shape cutting was performed at speeds of 42 to 46 in. per min, on ⅝-in. plate. There is no slag; the as-cut surface is of a quality that can be used without further finishing. Aluminum carbodies need no paint to protect them.

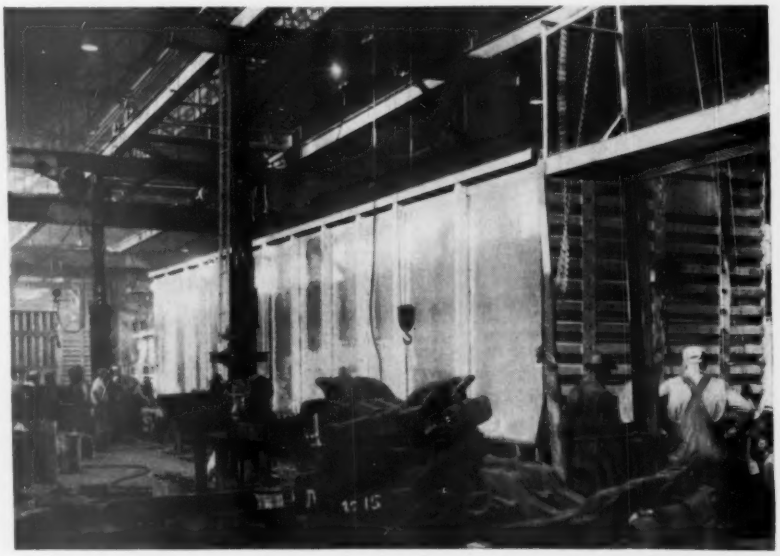
How did the men who actually built this record-breaking aluminum car order feel about it? Works Manager Bolen said, "At first we had plenty of doubts about this job. We'd never worked with aluminum before. And we were concerned about the stories we'd heard of how you had to 'baby' aluminum. As we got into the swing of this thing, the men in the plant proved all over again they knew what they were doing. Some outsiders said our schedule of 16 cars a day was impossible, but we did it with no strain. The men in the plant did a tremendous job and took a lot of well-earned pride in it.

"As far as 'babying' the aluminum, we handled it just like we've handled steel for years. The only major difference was that we used vacuum cups to lift the big sheets like the 118-in. by 574½-in. floor sheet."

It is thought that there is a good strong possibility that overall economies of aluminum fabrication could do much to offset the increased cost of base material. In addition, there is increased pay load, a decisive factor.

This Southern gondola weighs 47,300 lb against 63,000 lb for a comparable steel car. It uses four-wheel trucks where a steel car would possibly use six-wheel trucks, increasing weight still more. The four-wheel trucks used weigh 10,500 lb each. Steel center sill, couplers, and hardware account for another 9,300 lb. Weight of steel in each car totals 30,300 lb. as compared with 17,000 lb of the aluminum body.

Future cars can have weight reduced still further by using aluminum components such as brake rods, brake levers, hand-brake wheels and reservoirs, according to Reynolds engineers. It is also believed that assembly costs could be shaved by using aluminum center sills with all-welded underframes and bodies. Riveting and insulation between aluminum and steel would then be eliminated.



Welded subassemblies are put together on the Pullman-Standard production line. Assembly of extruded channels into complete ends was problem which was solved by welding reasearch.

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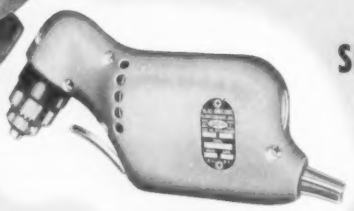
SuperPowered 1/4" & 3/8" DRILLS!

Here is super torque for the toughest jobs. And a speed for every need. Entirely new design has placed the brushes at the fan position at the front of the drill. Advantages include easier inspection and replacement without disassembly of the tool, and cooler running. Catalog No.'s 1472,73,74 — 1/4"; No.'s 1477,78,79 — 3/8".



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SIOUX No. 1495 1/4" All Angle Drill

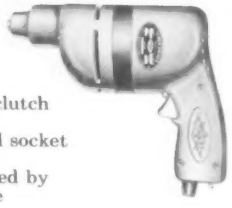
This exclusive SIOUX design is a favorite of men who work with tools. It's the most convenient, rugged, fistful of power. It operates in restricted space where other drills can't be used. All around usefulness on the widest range of jobs make this sturdy, dependable No. 1495 one of the world's best drill buys.

SIOUX

ELECTRIC SCREWDRIVERS

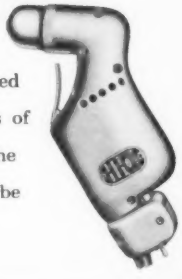
No. 260

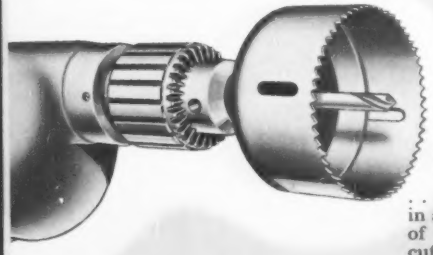
On No. 260 Super Screwdriver, the operator controls the tightness with which a screw is set by the amount of pressure he applies. The 1/4" Hex Drive takes shanks for clutch head screwdriver bits, Reed and Prince, Standard screws, Phillips, and socket (Allen Type). On the No. 262 Super Screwdriver tightness is pre-determined by adjusting the clutch. Both models are equipped with reversing switch.



No. 242

It fits the hand, and operates in restricted space like no other electric screwdriver. It quickly drives or removes all types of screws. No. 242 has a positive clutch; the operator controls the tightness by the amount of pressure applied. No. 246 has an adjustable clutch, so that it can be preset for any uniform degree of tightness desired.





SIOUX *High Speed* STEEL HOLE SAWS

. . . cut holes from 5/8" to 6" in diameter, in any free machining material to a depth of 1 1/8". Alloy or stainless steel may be cut at slow speed. High-Speed steel teeth welded to chrome-vanadium body give maximum life and cutting ability.

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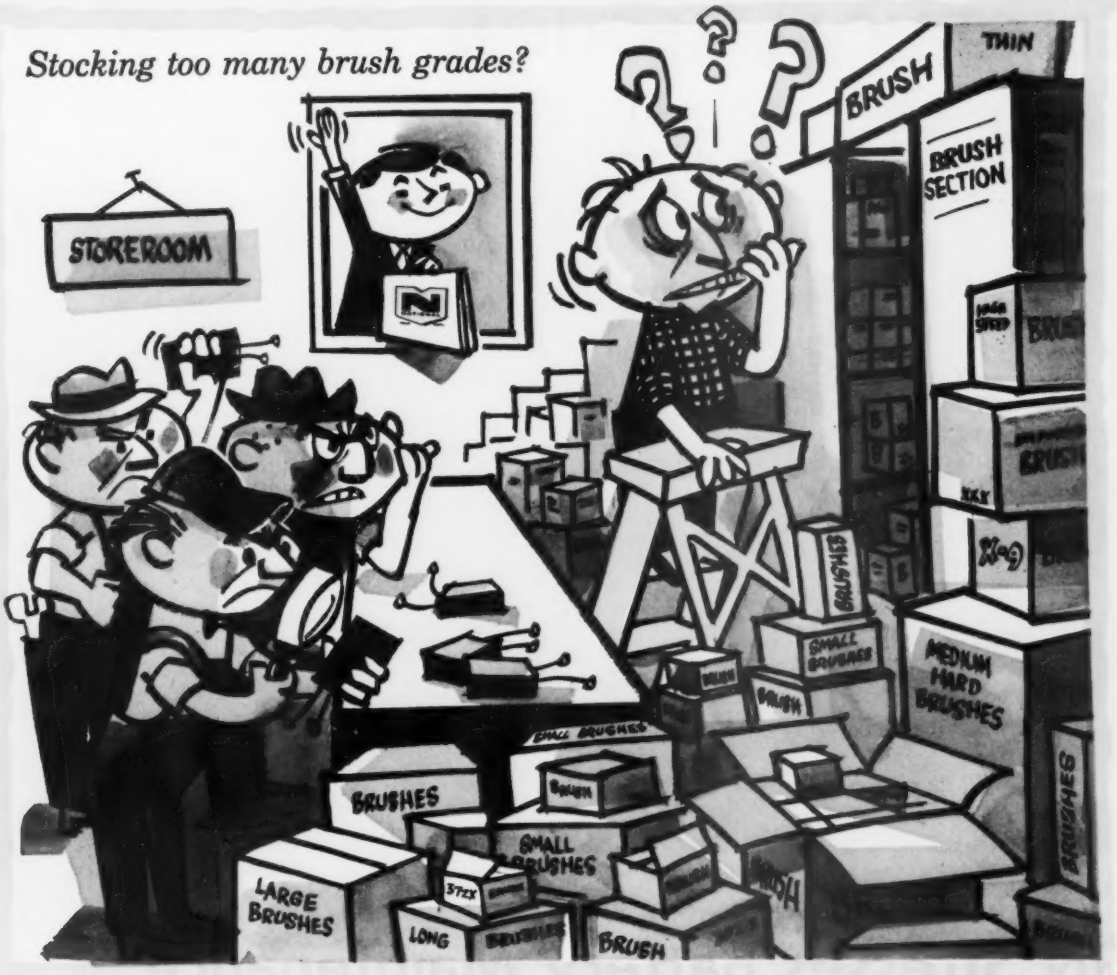
Stocking too many brush grades?



NATIONAL TRADE-MARK **stopped this brush mix-up with one all-purpose brush grade!**

C. F. EISELE

PROBLEM: This railroad used a number of different brush grades of the same size on similar auxiliary motors.

RECOMMENDATION: Chuck Eisele, after carefully analyzing work loads, recommended one "National" brush grade for all auxiliary motors.

RESULTS: Brush mix-ups and stocking problems were solved completely.

Contact your "National" Brush Man

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Division of Union Carbide Corporation • 270 Park Avenue, New York 17, New York
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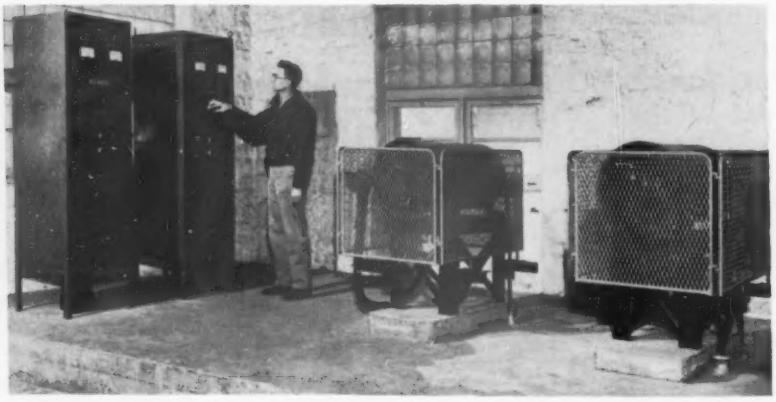
UNION CARBIDE

Panels, two 32 volt and two 64 volt, are all equipped for both charging and test discharging. Two batteries can be handled by each.

GN Stresses Battery Maintenance

Charging, maintenance and repair of storage batteries receive careful attention on the Great Northern. The GN has a financial investment, running into seven figures, in the batteries used on its 654 diesel units and 460 passenger cars.

Heart of GN battery maintenance is the shop in St. Paul, Minn., where 400 battery sets are handled annually. When a battery arrives in the shop, it is first cleaned. In one cleaning room accumulations of dirt are washed off by a special hot soda neutralizing solution which is sprayed by means of compressed air. The solution flows by gravity from a tank directly above the cleaning room on the mezzanine. For the removal of encrusted grease and dirt, the batteries are cleaned by steam in an adjoining room.



Charging current for the panels in the battery shop is supplied by two generators. Cables pass from control panels through floor to the work stations.

The battery trays, connectors, posts and other parts are then examined for cracks and other damage. If the battery jar or tray is cracked, or the battery has been in service for several years, one or two cells are pulled out of the trays for examination. If, in the opinion of the foreman, plates show damage, loss of active material, or excessive sedimentation, the battery does not warrant further attention and is scrapped.

Batteries which pass the preliminary examination are placed on charge, given an equalizing charge and test discharged. Charging equipment consists of two 40-hp gene-motors.

(Continued on page 64)

MORE THAN 1¼ MILLION
EQS WHEELS NOW IN SERVICE!

TOLERANCES ACCURATE TO
20-THOUSANDTHS OF AN INCH!

EVERY WHEEL 100 PERCENT
MAGNAGLO-INSPECTED!

SCIENTIFICALLY DESIGNED TO
DISSIPATE BRAKING HEAT!

GRIFFIN EQS IS KING

UNDISPUTED KING of railroad freight car wheels, that is. There are *many* reasons why, but we'll just list a few of them here...

Only Two Tape Sizes! Actually, 89 to 97 percent of wheels shipped from any of Griffin's plants are within two *half* tape sizes! This simplifies your wheel inventory... does away with endless hunting and searching.

Perfectly Balanced! The Griffin EQS is perfectly round as cast...requires no machining. The surface metal—toughest metal in the casting—remains on the tread and flange, where it reduces your wheel costs per car mile.

Griffin—the world's largest producer of freight car wheels—has five strategically-located steel wheel plants, and a sixth under construction, to provide you with the ultimate in service. For the highest return on your wheel investment, specify Griffin EQS.

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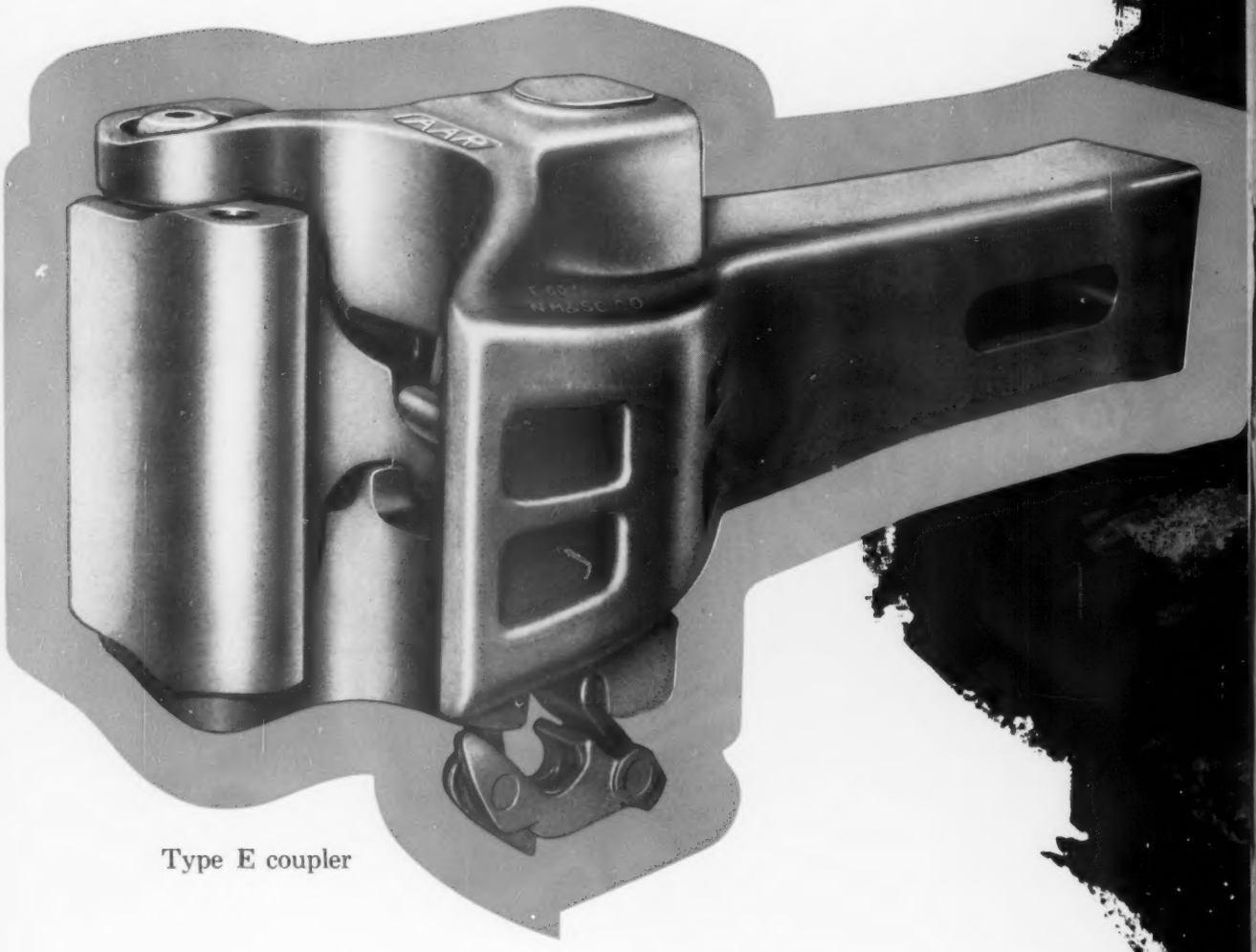
Couplers for Space Trains?

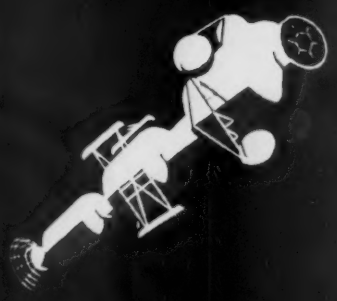
No one knows for sure but — For Sure —

National Coupler Leadership Will Make It Possible!



Type E coupler

A-2779A



NATIONAL COUPLER LEADERSHIP is real . . . can be measured in terms of experience, research and service.

EXPERIENCE extending over 66 years and producing over 13 million knuckle type couplers.

RESEARCH facilities of National's Technical Center that are unique in the railroad industry.

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COUPLERS • YOKES • DRAFT GEARS • FREIGHT TRUCKS • JOURNAL BOXES
NATIONAL SPEEDLOADER CONTAINER HANDLING SYSTEM

Heavy accumulations of dirt and grease are removed by steam cleaning when batteries first come into St. Paul shop for periodic checks.

Cells of batteries involved in accidents or in service for several years are first inspected to determine if further work is warranted.

(Continued from page 60)

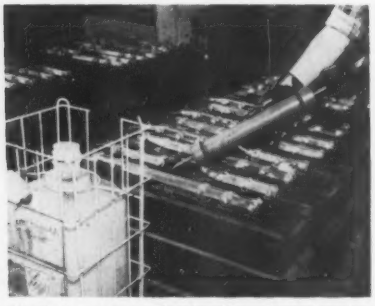
One is rated 500 amp at 45 volts to charge 32-volt batteries. The other is rated 300 amp at 90 volts to charge 64-volt batteries. Leads from these charging generators run in conduits under the floor to four panels on which batteries are discharged as well as charged. Two sets of 32-volt or 64-volt batteries can be handled at each panel.

When a battery is ready for test discharge, the leads are not changed. A switch disconnects the battery from the charging circuits and connects it to a variable resistance. The panel contains an ammeter and wattmeter so that the battery can be discharged at the controlled rate. GN batteries are discharged at the 5-hr rate to rated amp-hr capacity. Batteries which reach terminal voltage (1.75) before 5 hr are recharged and retested. If the battery fails a second test, it is retired.

Batteries are handled by fork-lift truck on the same type pallets used by manufacturers.

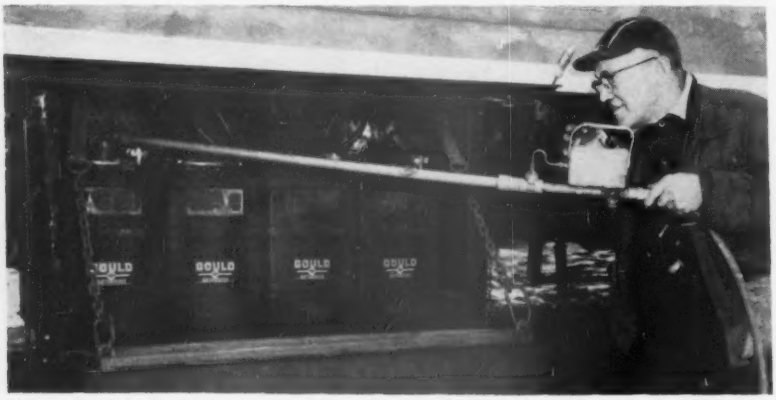
The GN battery shop men have developed a useful acid pump to draw electrolyte from the battery when adjusting the specific gravity. The pump consists of 2½-in. diameter plastic pipe, threaded and headed at both ends; a piston rod of plastic, and a piston of neoprene. Electrolyte is drawn from a cell by the pump.

The GN shop carries a stock of spare terminal posts, connectors and terminal cables. Complete equipment for lead burning is available, including an acetylene torch and molds. The torch receives oxygen and acetylene through piping from central tanks placed on the mezzanine. Before lead burning is begun, each cell is purged of explosive gases by introducing air into the top of the cell so that there is no danger of an unexpected flare-up during lead burning.

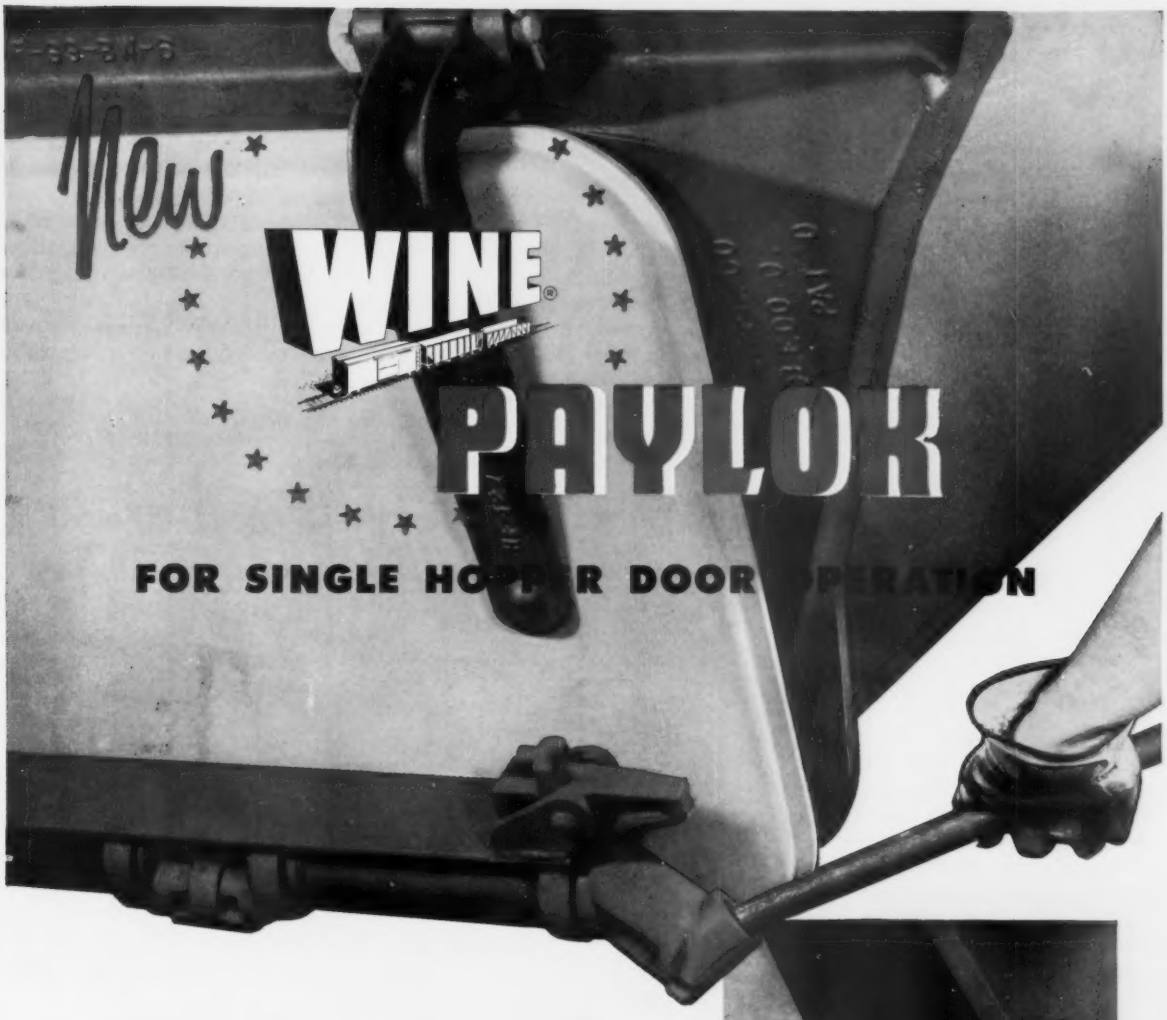


Plastic hand pump for handling electrolyte has plastic pipe body and neoprene piston.

Complete equipment for lead burning is available in the battery shop.



Electrolyte level is maintained on road by adding water through Gould cell filler. Terminal connectors are checked for tightness and general inspection is scheduled weekly.



THE ONLY HOPPER LOCK WITH PUSH-PULL ACTION!

SIMPLE INSTALLATION . . . requires the application of only two parts . . . the operating sub-assembly on the door and the adjustable latch pocket on the chute.

FULLY ADJUSTABLE . . . common irregularities in car construction can be easily overcome when door is applied to assure a tight door fit on every hopper.

ASK YOUR WINE RAILWAY REPRESENTATIVE FOR FULL PARTICULARS...OR WRITE TODAY!

THE WINE RAILWAY APPLIANCE CO. *Division of* **Unitcast** *Corp.* TOLEDO 9, OHIO

EMD Develops New Wheel-Slip Control

Part 2

First installment, appearing on page 41 of the August issue, discussed reasons for this development and the basic requirements of such a system.

Fig. 2 shows how the transductors are arranged in the circuit. Each transductor consists of two cores each with window area to accommodate two traction motor cables. The current through motors 1 and 3 goes from the No. 1 field through the windows of transductor WST14 from left to right to the No. 1 armature. The current from No. 2 and 4 armatures passes through WST14 from right to left and back to the No. 4 field. A similar circuit can be traced through transductor WST23. As long as the currents in the two motor branches are equal, there is no magnetizing effect on the transductor core. The net current through the transductor windows is zero and both transductors register zero output. If the No. 1 motor circuit carried 150 amps less than the No. 4 circuit, there would be a net of 150 amps through the transductors. A current of one amp would flow in the control windings which have 150 turns. The same condition would prevail if the No. 1 motor current exceeded the No. 4 circuit by 150 amps. To obtain a signal to operate a relay, the transductor coil current is connected in series with a resistance of about 25 ohms.

Fig. 3 indicates how two or more pairs of transductors are arranged so that only one wheel slip relay is required. Relays WCR and WS are in this circuit. The WCR is adjusted to operate at a lower value of transductor output than the WS relay. Rectifiers permit the relays to respond to the transductors having the highest output. The four-motor road locomotive system does not have a WSS relay. The WS relay performs this function in the series-parallel connection. The WS relay is re-calibrated to operate when the transductor registers 150 amps difference in motor current in the series-parallel connection, and at about 265 amps in parallel connection. The change in calibration is effected by a normally closed parallel contactor interlock (P3) in the AB coil.

Returning to the situation of a stalled locomotive starting a train and experiencing wheel slip, the components function in this manner. A significant change in motor current due to wheel slip will cause the WCR and WS relays to pick up. The WCR operates the sander, and the WS relay drops the battery field contactor. In the series-parallel connection, Diagram 1, the S13 and S24 contactors would be closed. Relays WS13 and WS24 would be connected to resistance bridges so the complete detection system consists of two transductors each comparing the same motor currents. These WS relays compare the voltages of the two armatures in

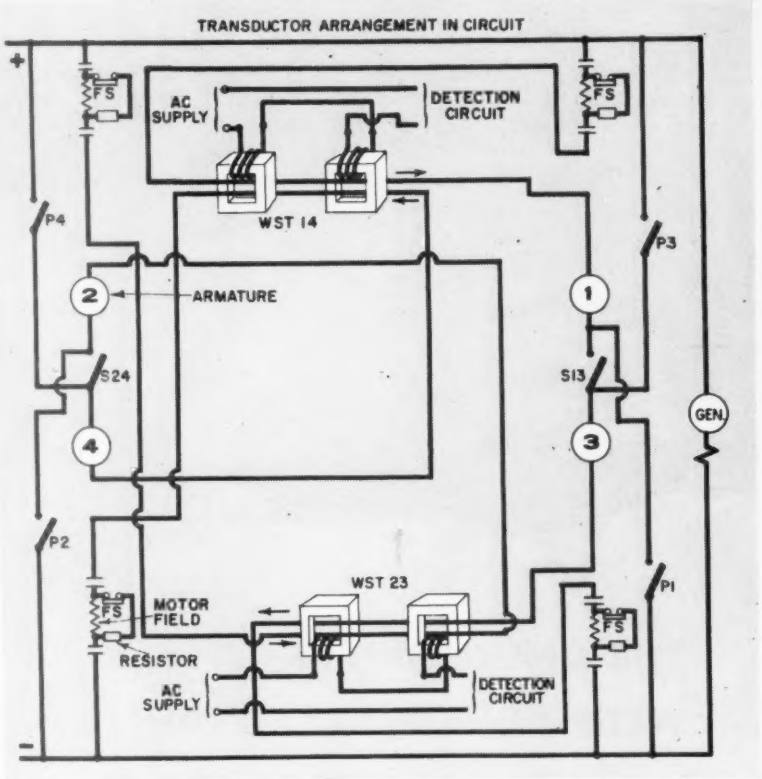


Fig. 2—Transductors operate in conjunction with a-c from the standard locomotive alternator. They are arranged in each of the power circuits and improve high speed sensitivity.

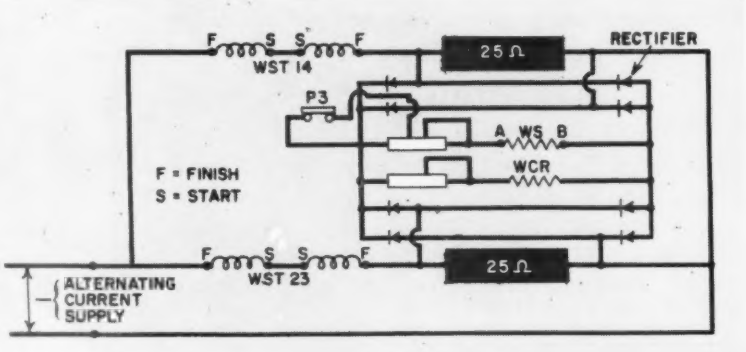
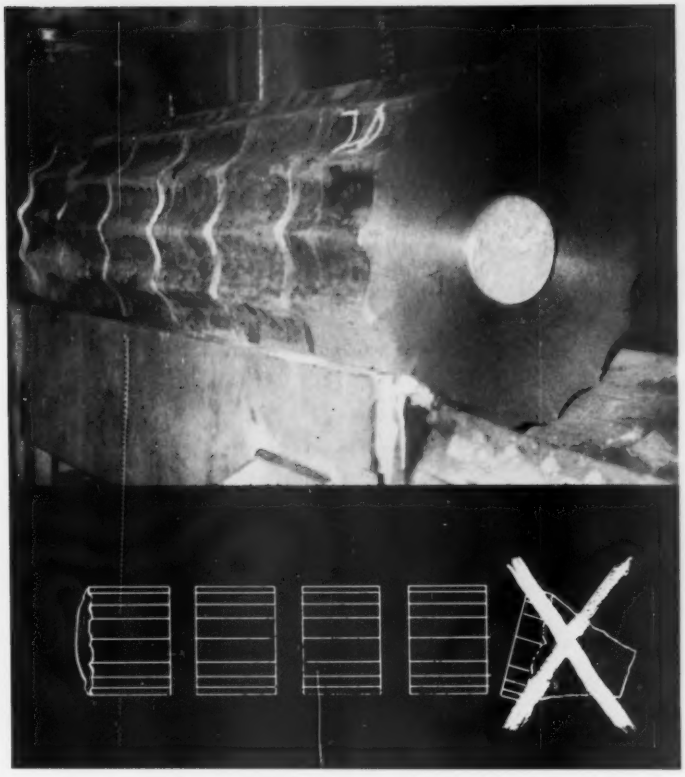


Fig. 3—Transductors are arranged so only one wheel slip relay is required. AB is main pick-up coil for wheel slip relay; WS is the wheel slip relay; WCR is the wheel creep relay.

This is the second of two articles on the wheel-slip control system developed for General Motors locomotives. The article has been prepared by the Electro-Motive Division.

How Armco "Discards" potential wheel defects



Impurities and shrinkage cavities are thrown away in the "top discard."

At Armco, special-analysis wheel steel is first poured into carefully proportioned corrugated ingot molds. Because of mold design, impurities and shrinkage cavities are located within the brick-lined hot tops. Then, after solidified ingots are cut into slices, *this top part is discarded*. Only clean steel goes into Armco Wheels.

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After heating, ingot slices are forged and rolled to become durable Armco Wrought Steel Wheels. And here's evidence that this forging and rolling plus Armco's accent on quality pays off:

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series, and the WCR and WS relays respond to the output of the transductors. The circuit designated as "WS relay calibrating circuit," is shorted out by the closed S24 contactor.

To clarify the purpose of the WS13 and WS24 relays, let us consider motors 1 and 2 as developing slip at exactly the same time and in such a way that the current in the branches does not unbalance. The voltage across the two armatures would increase, and in turn would operate the WS13 and WS24 relays. This is not the primary purpose of these relays. It has never been possible under test conditions to produce such a situation.

Increased Sensitivity

Actually, the sensitivity of the voltage relays increases as the locomotive speed increases, and the current relays become less sensitive. At some intermediate speeds, the sensitivity of the two is the same. At higher speeds, the voltage relays become the primary detection elements. In series-parallel connection, the current and voltage relays both recognize irregularities in the transmission system such as motor flashing, or unequal motor field shunting.

Referring to Fig. 1, with the motors connected in parallel, contactors P1, P2, P3, and P4 would be closed. S13 and S24 would be open and their interlocks have disconnected WS13 and WS24. WST23 now compares only the current in motors 2 and 3, and WST14 the current in motors 1 and 4. The WS relay calibrating circuit is also connected across the generator, and the WS relay is calibrated to 265 amps when the generator voltage is zero. The WS relay is calibrated for about 65 amps motor differential when the generator voltage is 1000 and the FS interlock is open. When the FS interlock is closed, the WS relay picks up when the generator voltage reaches 925 even when there is no difference in motor current. With this arrangement, the current differential between a pair of motors necessary to signal a wheel slip is a function of generator voltage at the time slip occurs. It also recognizes motor overspeeding even if there is no motor current differential.

The operation of the WS relay calibrating circuit can be described in greater detail. Its purpose is to modify the value of the pickup of the WS relay in such a way that it requires about the same percentage of motor current to operate it over a wide speed range at constant power. These are the functions of the two coils in the WS relay. Coil AB is the main coil connected to a voltage proportional to the difference in motor current. Coil CD is connected so that the generator (or motor) voltage aids the AB coil to pick up the relay. When the motor operates at full field, a 7000 ohm resistor and the adjustment of a slider on a potentiometer determine how much the CD coil adds to the AB coil (to obtain WS pickup at 65 amps motor current differential at 1000 volts). When the motor fields are shunted, this same 7000 ohm resistor and potentiometer are effective up to some predetermined value of generator volts which corresponds to normal conditions of full power at maximum permissible speed. Under this condition, the voltage across the 7000 ohm resistor is equal to that of the voltage reference tubes connected in parallel with it through the FS interlock and rectifier. Any rise in generator voltage (which is the load control response to slip) above this value causes current to rise rapidly through the voltage reference circuit and the CD coil of the WS relay. This detects overspeed within a close proximity of the maximum permissible even when no current unbalance exists in the motor circuits.

The curves in Fig. 4 show the degree of slip detection provided by the EMD system. The vertical distance in mph between the two curves is the mph differential between the three axles not slipping and the spinning axle during a slip which will pick up the relay. The straight line curve portion above 65 mph represents the action of the sensitometer. This shows that at full power, the relay will pick up at approximately 70 mph—if no wheels are slipping, or if all wheels spin up to that speed simultaneously. The newest four-motor locomotive wheel slip detection is applicable to any locomotive which has suitable alternating current supply available.

The variable voltage, variable frequency alternator basic to all road locomotives built, except the FT's is the suitable alternating current supply for the transductors.

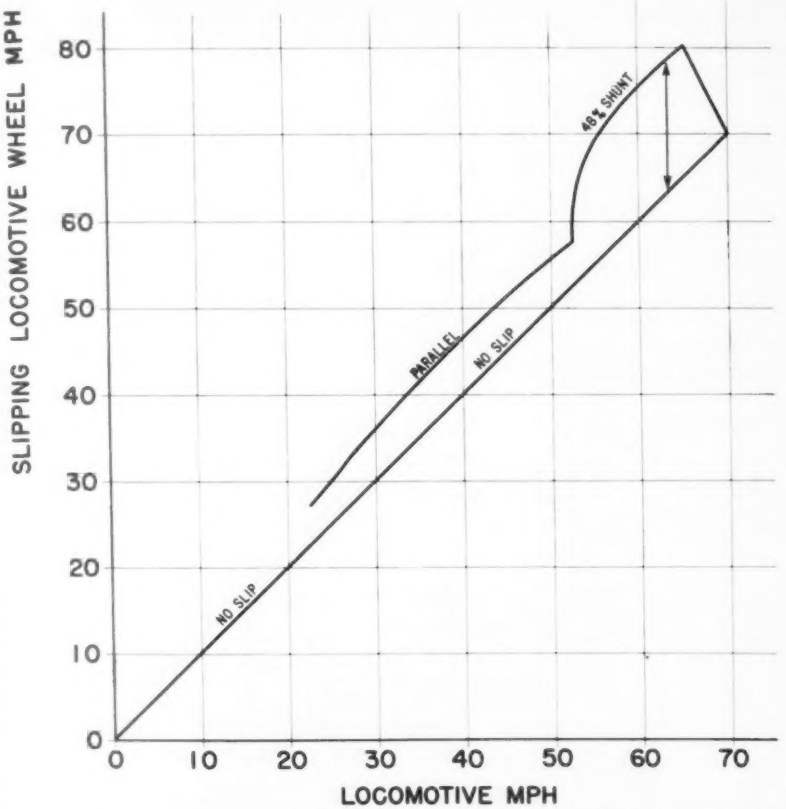

Fig. 4—Wheel speed differential which will activate the improved wheel-slip detection equipment is shown. This is for a four-motor road locomotive with 62/15 gearing and new wheels. The sensitivity of the equipment is indicated in the parallel and parallel-shunt ranges where previous equipment frequently failed to detect high-speed wheel slips.

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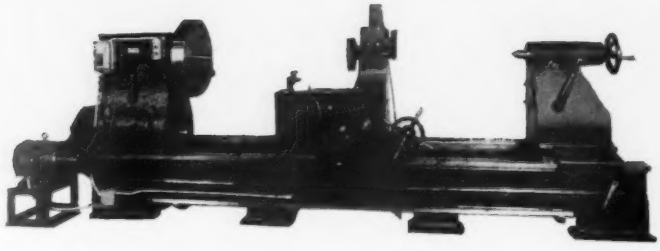

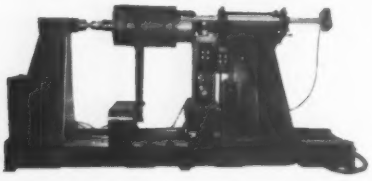

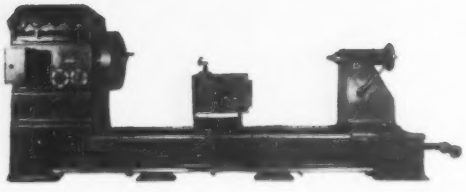

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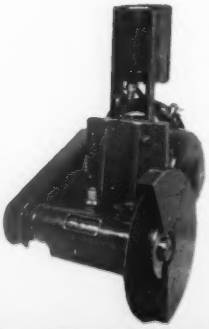

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Missing Horsepower

By Jon Maurice

The radio in the Diesel Office came to life with a crackling: "Extra 301 calling the diesel shop."

Electrical Foreman Brad Sparks raised his eyes from the daily line-up book and cocked an ear toward the radio as the desk clerk acknowledged the call and asked, "What's your trouble?"

"Horsepower," thundered the reply, unmistakably identifying the speaker as Engineer Ties. "Our lead unit, this 301A, is just not producing the horses! Everything checks out and the engine sounds fine. We are just coming over the top of Buzzard Pass. Tell that 'Wire Wizard' in your office to meet us when we get in and give us a run-down on this trouble."

Brad Sparks smiled and made a mental note of the fact that the 301A had apparently developed difficulty after coming over the heavy grade out of the Canyon and was now headed home over fairly flat terrain. There would be no more demand for full horsepower from the four-unit locomotive.

Sparky and his ace trouble-shooter, Ed, climbed aboard the 301A as it rolled to a stop and were met by the engineman who exclaimed, "By golly, Brad, how can an engine be unloaded when both the Series Contactors—S14 and S23—come in; generator-shunt field and battery field contactors come in; engine responds to speed control, and there are no fuses blown. Furthermore, the load regulator stays in maximum field position and the engine governor power piston is way long, which indicates the engine is unloaded, doesn't it?"

"It certainly does," answered the foreman, "and from those indications I would say that the main generator battery field circuit may be open."

The engineman shook his head and said, "Well, Brad, the battery field contactor was closed and the 80-amp fuse was good."

"What you say is no doubt true," Sparks. "However, there are several other parts of that circuit that can give trouble. The positive and negative sides of the main generator battery field winding connect to separate terminals at a terminal board in the lower housing of the Main Generator. From this point they pass through conduit into the high voltage cabinet, where the negative wire is connected through the N-O contacts of the auxiliary tandem switch to the negative side of the control circuit. The positive wire is connected through the main contacts of the battery field contactor, the K-L contacts of the auxiliary tandem switch, the load regulators, and through the 80-amp battery field fuse to the positive side of the control circuit. Let me draw you a little sketch of this circuit and we'll number the possible points of trouble starting at the 80-amp BF fuse."

When Brad completed his sketch, the engineman exclaimed, "Check off No. 1; that fuse is OK."

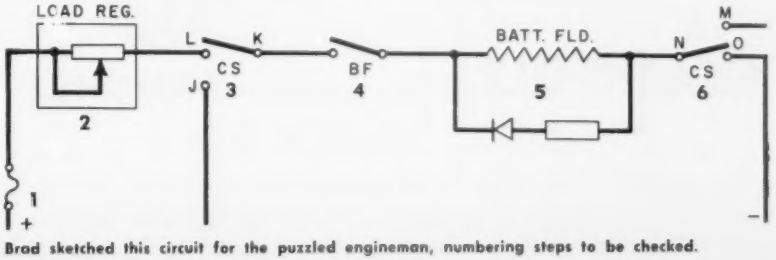
"Ed, the electrician, has just finished inspecting No. 2, the Load Regulator," Brad went on. "Now let's have a look at this Auxiliary Tandem Switch."

Sparks explained that the Tandem Switch was an enclosed auxiliary switch located on the top plate of the big cam switch and was actuated by a chain-drive from the cam switch shaft. He emphasized that the tandem switch was fully enclosed with its contacts, inaccessible without complete disassembly. Only contact ears protrude from the switch to make it possible to connect control wiring. Close inspection of the switch revealed that the K-L contact ears were badly discolored and probably had been very hot."

"Looks like this is our trouble," said Sparks. "We'll have a closer look when Ed tears down the switch."

"What's the purpose of that tandem switch?" asked the engineman.

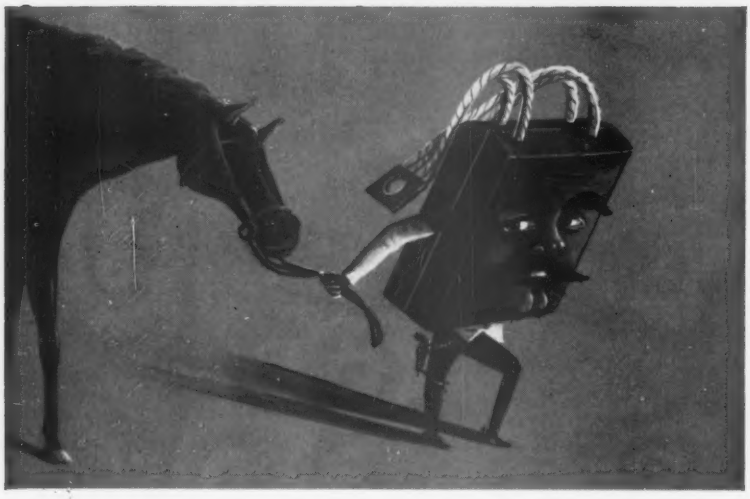
"The auxiliary tandem switch," answered Sparks, "contains many sets of contacts necessary to segregate the power and dynamic braking circuits on this unit. The switch is constructed of layers of discs of a composition insulating material. Each layer contains several sets of contacts. Stationary contacts are mounted in the outer edge of the discs. The rotary interior portion is secured to the actuating shaft which passes through the center of the switch.



Brad sketched this circuit for the puzzled engineman, numbering steps to be checked.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

WANTED



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wanted for railway robberies involving diesel-electric locomotives. Nationwide record of previous arrests often resulting in suspect being run out of town on a rail. Known to be physically infirm, subject to fractures and broken shunts. When heat is on, suspect hides out behind innocent commutators.

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It is controlled by the operating shaft of the cam switch, through a sprocket and chain-drive assembly.

"The auxiliary switch has a timing mark on the top of the shaft which indicates whether the switch is in the motor or tow position. When a switch is replaced, the new one must be timed to correspond with the position of the Cam Switch which actuates it. Each set of contacts in the auxiliary switch operates like a small knife-switch. The continuous opening and closing of these contact surfaces make good lubrication necessary; otherwise, wear would soon reduce the contact pressure, causing high resistance and resulting in arcing and burning of the contacts. We've changed our maintenance procedure to require a more frequent inspection of the auxiliary switch. Every four years tandem switches are disassembled, new contact components are installed if needed, and a new lubricant is applied to all internal parts."

Ed stepped back from the cam switch and handed the engineman the tandem switch disc containing the K-L contacts, remarking "burned wide open."

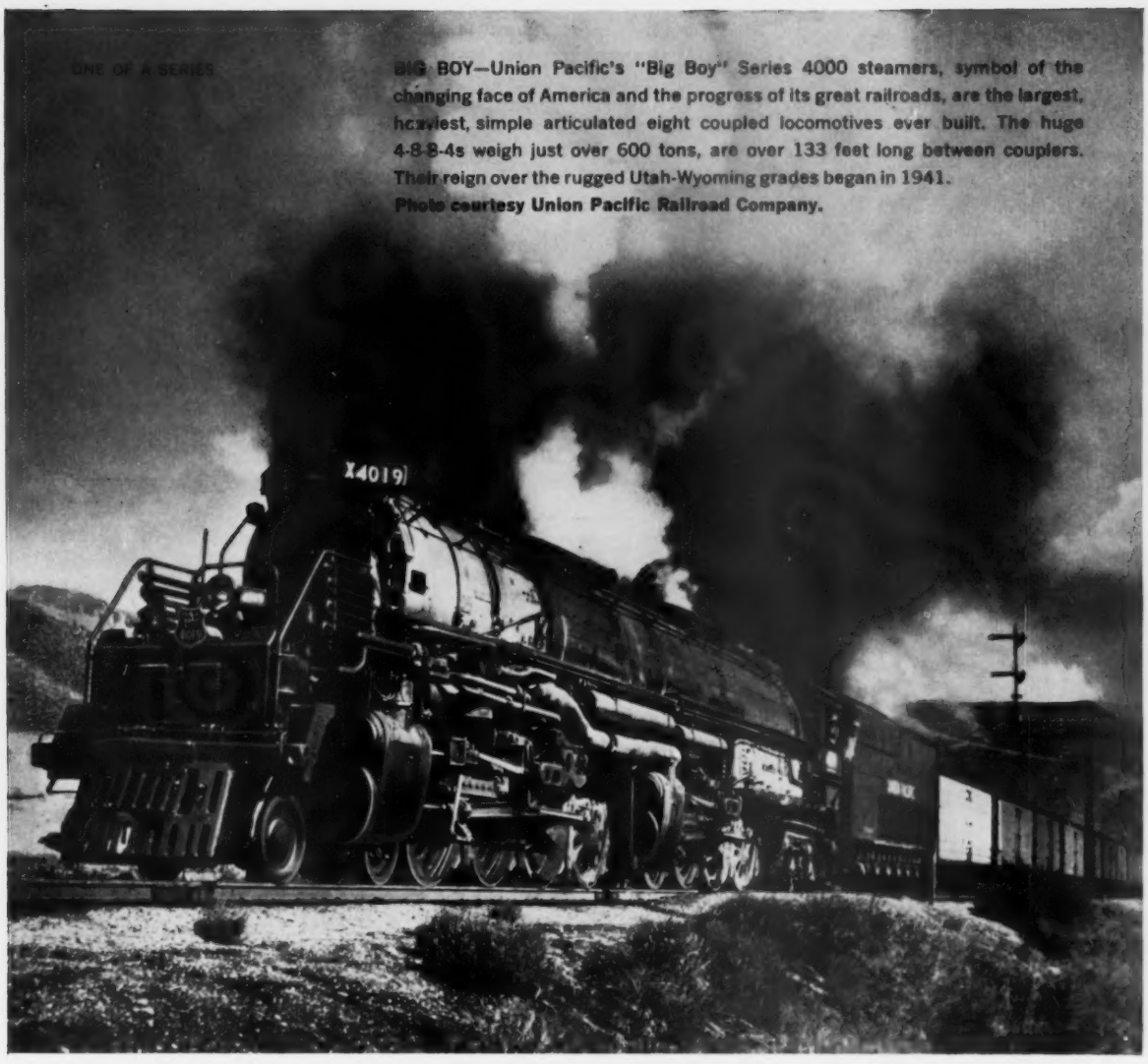
After studying the burned contact assembly, Ties asked, "What do you think caused this failure?"

"Wear, caused by loss of lubrication," Brad replied. "Apparently this switch has not been handled under our new maintenance program. This unit is due for an annual inspection next month. The tandem switch would be changed then, but we will replace it this morning instead."

"Well," said the engineman, "when the battery field circuit opens up so that 1,500 horses are gone, it shows this little K-L contact is important."

"That's right," replied Sparks, "the auxiliary switch and the other equipment in the battery field circuit have a tough job to do. When the load regulator is over in the maximum field position, approximately 60 amp is flowing through the switch contacts to the battery field windings of the main generator. The switch must be of good design and material and have good maintenance to handle this job.

"Speaking of jobs, I have several that are waiting for me back in the shop, so I will have to be on my way. Your report on this trouble was very accurate, and I hope my explanation of this equipment and its circuits has been of some benefit to you."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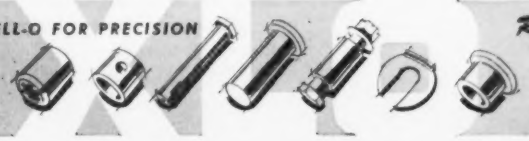


Railroad Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Wheel Problems

(Continued from page 50)

of slid flats considerably. Maintaining brake rigging to assure complete releases, minimizing and equalizing shoe travel, and careful maintenance of hand brakes aid in cutting down on slid flats.

A wheel failure is the occurrence of a fracture which either causes part of the wheel to break off, or is large enough to make it unsafe for further use. Some failures are caused by a malfunction, such as a stuck brake. Others are associated with manufacturers' defects. In some cases, an accumulation of severe service stressings may cause a wheel to fail even when wheel quality is good. Because wheel fractures are progressive, inspection at proper intervals and watchfulness on the part of maintenance and train crews give protection against failures.

Some service, equipment, and maintenance conditions can accelerate wear. Wear does not result simply from rolling of the wheel on the rail, but from slipping contact between two such surfaces. This phenomena occurs between wheel and shoe during braking and between wheel and rail during normal running. While rolling, this abrasion occurs when tapered wheels of a mounted pair move laterally on different circumferences at their rail contact points. Conditions such as improper mating, unequal, or misaligned braking, and skewing trucks also produce excessive slipping or flange contact.

Hardness is the most important factor affecting this metal-to-metal abrasion. The harder the wheel, the more resistant it is to wear resulting from brake shoe and rail action. This is slightly modified by chemical composition of the steel.

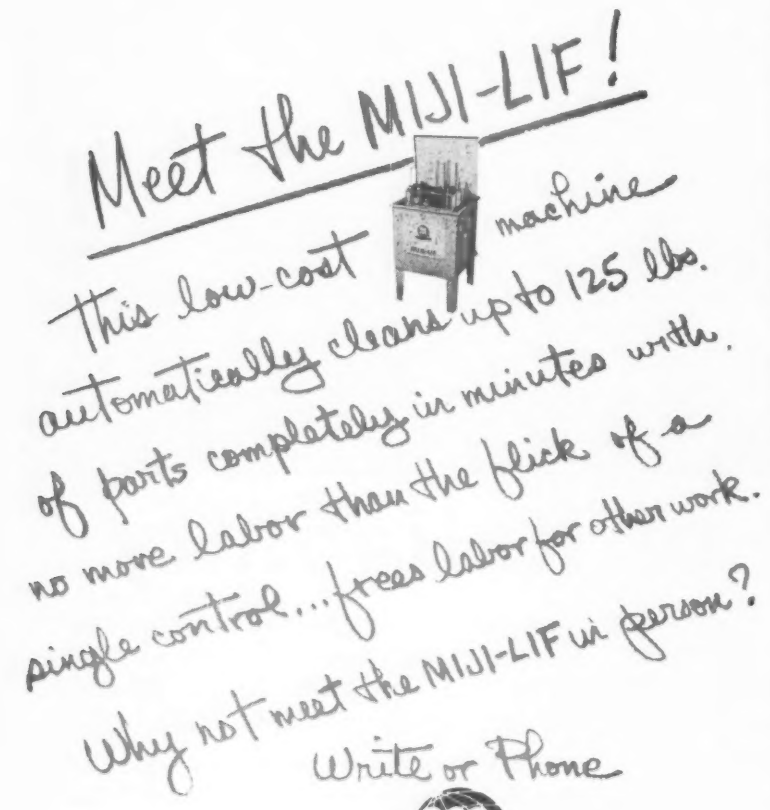
Effect of hardness seems to be related to load, speed, and braking. In a test on passenger cars, heat-treated wheels with treads having 321 Brinell averaged only about 8 per cent more mileage than standard wheels having a 255 Brinell. This test involved relatively light loads, high speeds, and heavy braking. In another test involving 95-ton ore cars, treated wheels of 321 Brinell gave almost 50 per cent more mileage than untreated (255 Brinell) wheels. This test involved heavier loads, slower speeds, and lighter braking. It is difficult to predict, without trial, just how much difference wheel hardness will make in service.

Here, again, speed and braking play important roles, along with equipment weight and maintenance. Heavy braking, associated with high-speed equipment, develops high heat and tends to abrade treads. Slippage, producing relative motion between wheel and rail, also increases as speed goes up.

There is evidence that weight of equipment has a critical effect on wear. In one test, using Class A wheels on 135,000-lb sleeping cars and 110,000-lb coaches on the same train, mileage was found to be almost 50 per cent greater on the coaches. In another test, lightweight coaches were found to have 20 per cent higher wheel mileage than heavier coaches. Phenomenal mileages have been recorded for wheels where the load was under about 350 lb per inch of diameter. In the case of freight equipment, such as ore cars, loaded weight might be limited when wheel wear is so excessive as to be economically significant.

Truck maintenance and design play vital parts in their operation. Conditions that cause excessive skewing of trucks can produce rapid flange wear and unequal wear which accentuate the differences in circumference of a pair of wheels. Lubrication and clearances are also important. When center-plate action of the truck is inhibited by too much friction, wheel flanges bear excessively against the

(Continued on page 76)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of parts completely in minutes with
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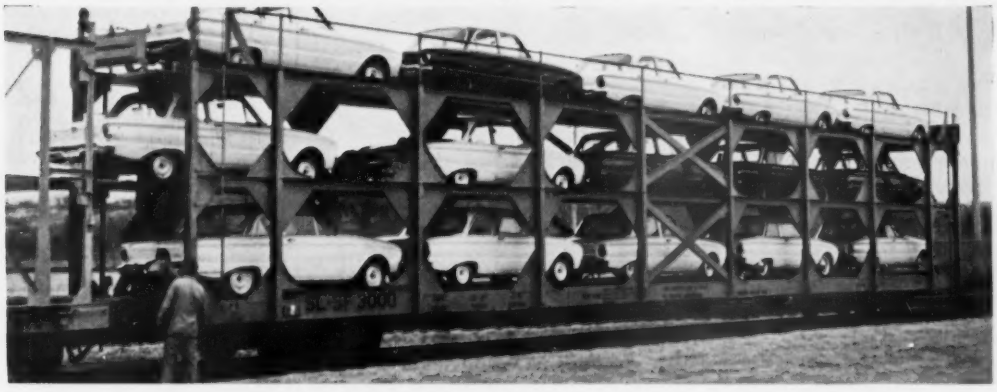

the HEART of MASS RAIL AUTOMOBILE SHIPMENT IS THE TIE-DOWN!

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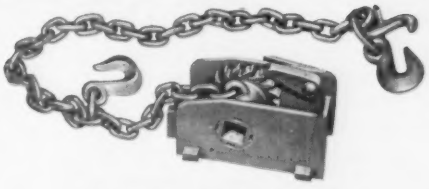
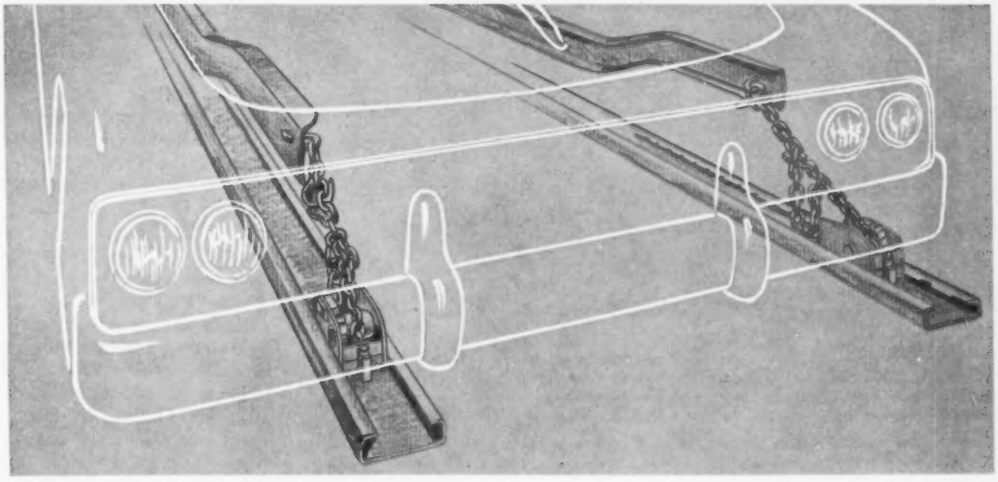


SPECIFY THE Brandon AUTO-TIE

The Brandon AUTO-TIE meets specifications issued by automobile manufacturers and is used exclusively on rail cars with permanent tri-level superstructure now in service or under construction.



Brandon EQUIPMENT COMPANY, INC.
332 South Michigan Avenue, Chicago 4, Illinois

rail. Other important considerations are proper wheel spacing, alignment, and correction of unequal wear in truck parts, such as pedestal liners.

Selection of wheels is largely a matter of eliminating types that have given trouble. If thermal cracking is troublesome, for example, wheels of lower carbon content can cure the problem. If the difficulty is shelling, a harder wheel is indicated. Heat-treated wheels give longer wear.

On the other hand, it may be too costly from an inventory or replacement standpoint to change wheels. Many times certain types of wheel damage can be reduced at low cost by attention to operating and maintenance practices. Sometimes new locomotives or cars sustain severe wheel damage initially. This disappears when maintenance catches up with maladjustments and malfunctions, and when operating procedures are corrected.

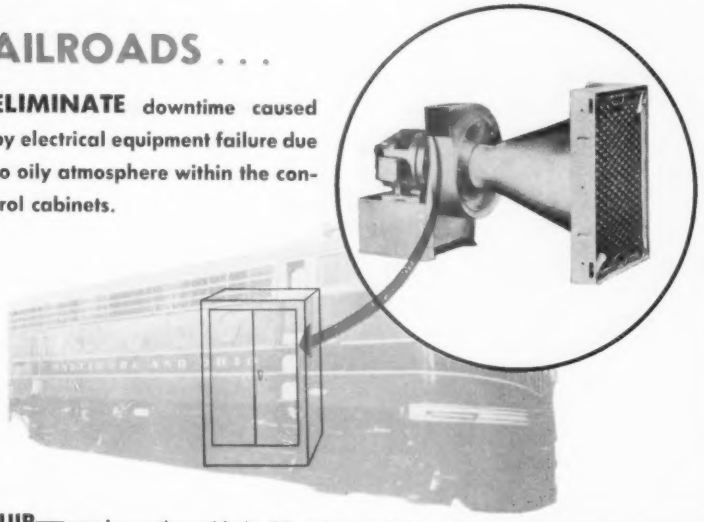
The following service test conducted by Armco Steel Corporation in cooperation with a railroad illustrates the situation well. At the start of the test, Class B wheels under passenger diesels suffered 20 per cent removals for thermal cracking and 20 per cent removals for shelling. Test wheels involved Class B and Class A wheels. During the test, operating and maintenance factors were examined. Close attention was given to speed, braking, schedules, truck lubrication, and elimination of excessively worn truck parts. Within one year, thermal cracking of Class B wheels had been reduced to about 2 per cent and shelling to 5 per cent.

Class A wheels had no thermal cracking and about 5 per cent shelling frequency. Mileage for shelling removals on Class A wheels was less than Class B wheels. Also, more metal had to be removed from Class A wheels to recondition shelling removals. At the end of the test, the railroad was using the same wheel as before, but shelling and thermal cracking problems had practically disappeared at no increase in cost.

WANTED: Surplus or used, E.M.D. injector plunger & bushing assemblies #5227853, #5228236 .421 diameter, GM-DD Series 110 plunger & bushings and parts. Rail, 2093 East 19 Street, Cleveland 15, Ohio.

RAILROADS . . .

ELIMINATE downtime caused by electrical equipment failure due to oily atmosphere within the control cabinets.



EQUIP—your locomotives with the EJB custom made Control Cabinet Pressurizing Assembly Kit #100.

CONSTRUCTION—this unit was designed specifically for heavy duty railroad service. The blower and transition unit are made of heavy gauge steel. Filter is the approved railroad type. The motor is of ample size and capacity to give long service without maintenance on an annual basis. This unit can be applied to any manufacturer's type Diesel Electric Locomotive.

TESTED—an Alco Road Unit was equipped with an EJB Pressurizing Kit #100. This unit operated for a period of approximately 15 months. During the time of service no maintenance was required on contacts, interlocks or other electrical operating parts. Also the cabinet required no cleaning.

*Patent Applied For

EDW. J. BOYLE COMPANY

1840 CECIL ST. Phone STerling 1-1000 PITTSBURGH 15, PA.

Contact above for prices and other information

NOW any Locomotive can be equipped to deliver DRY and NON-Corrosive Air throughout Train Lines and Brake System

PATS. PEND.

Van-Air® DRYER

When equipped with a VAN-AIR DRYER, any locomotive can deliver dry, purified compressed air throughout the train lines—and thereby prevent corrosion and freezing of air equipment and brakes.

The VAN-AIR DRYER *not only* extracts condensed water from compressed air (which stops freezing of air lines during winter temperatures) —*much more important* it intercepts residual vapors, acid fumes and microscopic solids which flow downstream from reservoir. By reducing these elusive elements the Dryer prevents the incessant corrosion or varnishing of internal metal surfaces exposed to the flow of air.

The VAN-AIR needs little space, is automatic, requires no heat or power—never needs regeneration. It delivers air dry, pure, non-toxic—and operates at the very nominal cost of

LESS THAN 1-CENT per 18,000 CU. FT.

ENGINEERS! Look into the sizeable savings in maintenance costs and parts replacements now practicable with Van-conditioned air. Ask for brochure which explains the economical Van-Air method—tested, proven and used in many hundreds of industrial applications.

ALSO for YARDS, SHOPS, BRAKE TESTING, etc.

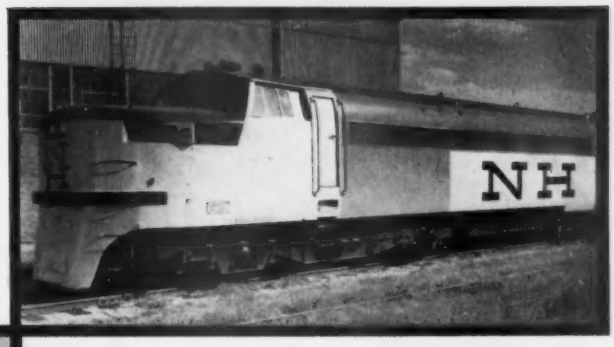
Built in 35 capacities there is a Van-Air Dryer properly rated to treat any volume of compressor output—from total air for largest yard or shop operation down to minimal air for brake testing, remote tools, spraying units, etc. Ask for details.

VAN PRODUCTS CO. • MFRS.

5787 SWANVILLE ROAD, ERIE, PA.

Equipped with dependable Sprague
AIR-PUSH Windshield Wipers!

Sprague Air-Push Windshield Wiper Motors are "standard" on the railroads. Used on more than 95% of all diesel electric locomotives. This overwhelming support by the safety conscious railroad industry is not unwarranted. **Air-Push Equipment does a better job!** Large windshield areas are kept clear in severe weather at high speeds. Maintenance is minimized. Parts, when needed, are always available, easily replaced.



Sprague DEVICES, INC.
MICHIGAN CITY, INDIANA

Safety Starts with Seeing!
Air-Push Wipers are standard on all Baldwin Lima-Hamilton Locomotives.

What's New

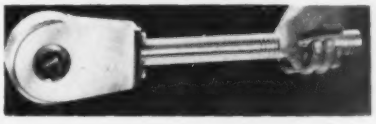
(Continued from page 17)

Lubricant Container

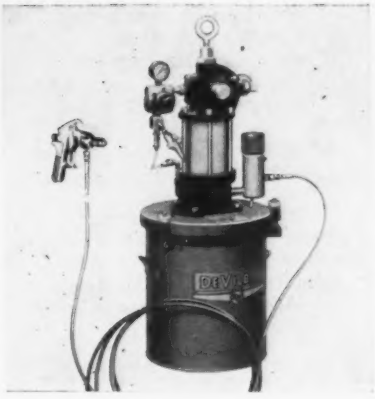
To help eliminate contamination of greases and grease-applying brushes with dirt and other abrasive materials, an oil-resistant molded plastic jar with an applicator brush for Molykote G has been developed. A protected well in the center of the jar stores the brush free from possible contaminants when the cap is replaced. The jar contains a supply of Molykote G in the ring section surrounding the brush storage well. A synthetic rubber washer seals the jar proper when the car is replaced, and a concentric fiber washer prevents the grease from entering the brush storage well. The brush is securely attached to the cap which serves as a convenient brush handle. *Alpha-Molykote Corp., Dept. RLC, 65 Harvard ave., Stamford, Conn.*

Impact Wrench

The Swench, a manual impact wrench, is said to loosen "frozen" nuts in seconds and to tighten them to the maximum practical. No auxiliary equipment or power connections are needed. The wrench can handle



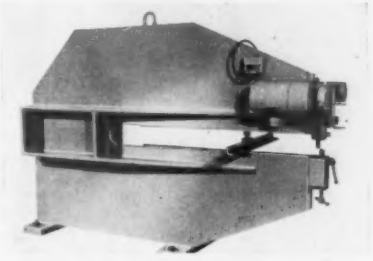
more bolt sizes than any power wrench, and loosening or tightening requires no special adjustments. Power, built up in a super-strong spring, is released as torsional impact each time the handle is advanced slightly more than 30 deg. An easy-to-hear click tells of each impact. The Model 750 wrench is for bolts ½ to 1¼ in.; Model 1000, for bolts ¾ to 1¾ in.; and Model 1500, for bolts 1¼ to 2½ in. *Marquette Division, Curtiss-Wright Corp., Dept. RLC, 1145 Galewood Drive, Cleveland 10, Ohio.*



Improved Airless Spray

The new economy airless spray painting equipment features the same basic units as the regular DeVilbiss airless outfit (RL&C, November 1959 p. 64). It uses the same pumping unit and the same spray gun, and includes a refillable, 10-gal tank with clamp-lock lid, pressure control regulator and gage, air-motor-driven agitator, filter, and positive air shutoff valve.

An automatic airless gun has been designed for industries which already have automatic finishing machines. It is compact and can be used to apply all types of material that can be sprayed with airless equipment. Two models of pole guns make possible a reduction in scaffolding and rigging on some jobs. The smaller capacity cap reduces the amount of material spray to meet certain requirements, while the swivel connection allows greater freedom of work, with greater speed. *DeVilbiss Co., Dept. RLC, Toledo, Ohio.*

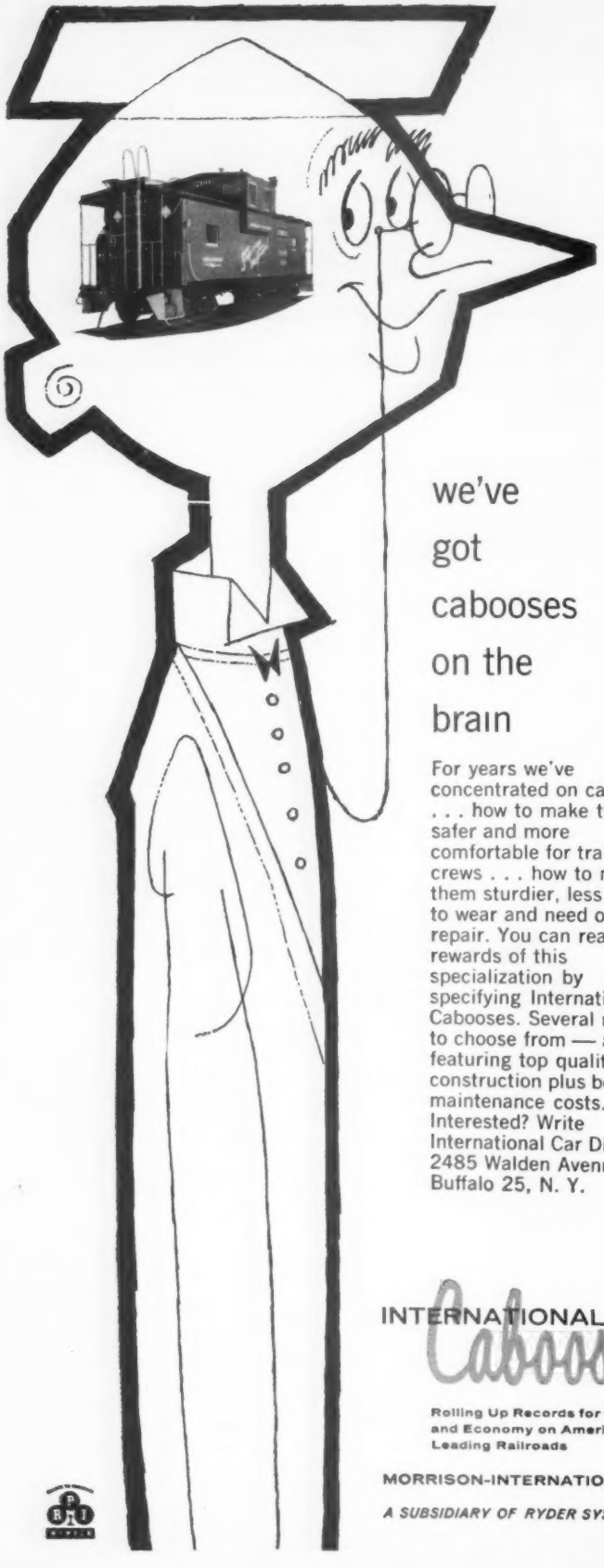


Shearing and Forming Machines

A new line of five universal shearing and forming machines is said to offer an economical method of straight, circular, and irregular shearing, plus slotting, folding, beading, joggling, edge bending, and louver cutting. Capacities range from 14 gage up to 7/32 in. in mild steel. *American Pullmax Co., 2455 N. Sheffield ave., Chicago 14.*

Automatic Hose Reels

The Model A-3 Reel-King automatic hose reel holds 25 ft of ⅜-in. or ¼-in. single hose. It is constructed of stamped steel and cast aluminum, with brass shaft and connections. The spring-operated reel drum locks for 170 deg of each turn and is easily reversed by a pull on the hose. Teflon chevron type seal rings operate on a stainless-steel spindle. The temperature range of the reel is -120 to 500 deg F, and maximum operating pressure is usually limited only by the hose. Model A-3 is recommended for paint booths, test bench



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For years we've concentrated on cabooses . . . how to make them safer and more comfortable for train crews . . . how to make them sturdier, less subject to wear and need of repair. You can reap the rewards of this specialization by specifying International Cabooses. Several models to choose from — all featuring top quality construction plus bottom maintenance costs. Interested? Write International Car Division, 2485 Walden Avenue, Buffalo 25, N. Y.

INTERNATIONAL Cabooses

Rolling Up Records for Safety and Economy on America's Leading Railroads

MORRISON-INTERNATIONAL CORP.

A SUBSIDIARY OF RYDER SYSTEM, INC.

and work bench hose, and for suspended air guns, tools, etc. The Model OA-3 Weld Reel, illustrated above, holds 25 ft of 3/16-in. twin hose, or 20 ft of ¼-in. twin hose. Its construction and ter perature range are similar to the A-3.

The Model A-4 heavy duty automatic reel holds 50 ft of ¾ in. ID, 2-braid, single hose. It is constructed of steel stampings and welded steel tubing. The reel drum is ball-bearing mounted and operated by a clock type motor spring. A ratchet type locking mechanism locks during 170 deg of each turn of the drum. The reel can be mounted in any position. *United Specialties, Inc., Dept. RLC, El Dorado, Ark.*

Window Washer

The model 6-½ window washer with telescopic handles allows shop windows to be washed at heights up to 66 ft while the operator remains on the ground. A reduction in handle length permits use on passenger cars and station facilities. Wide flaring brushes are said to clean corners and trim of the windows, as well as the window panes. A dispenser for compressed detergent tablets is available with the washer. According to the manufacturer, these tablets will last one-half day of continuous washing. *Tucker Manufacturing Co., Dept. RLC, 112 Fourth ave., S.E. Cedar Rapids, Iowa.*

Personal Mention

Denver & Rio Grande Western. — *Denver, Colo.:* JOSEPH J. SCHMIDT appointed assistant director of research.

Gulf, Mobile & Ohio. — *Mobile, Ala.:* P. E. DEWITT appointed general master mechanic.

New York Central.—*Springfield, Mass.:* J. E. DEFREEST appointed master mechanic. *Utica, N. Y.:* F. A. DANAHY appointed master mechanic. *Syracuse, N. Y.:* D. A. SWANSON appointed district car inspector.

Norfolk & Western.—*Roanoke, Va.:* W. K. RAMSEY, gang leader, appointed assistant foreman, locomotive department, Shaffers Crossing. *Kenova, W. Va.:* MILTON H. JAYNE appointed general foreman, succeeding O. S. HOLMES, retired. J. L. BARKER, appointed car foreman, succeeding Mr. Jayne. *Kimball, W. Va.:* J. C. BOYCE appointed gang foreman, succeeding Mr. Barker. Formerly gang foreman at Iaeger, W. Va.

Soo Line. — *Marshfield, Wis.:* PETER W. DENIS appointed locomotive and car foreman.

Southern. — *Selma, N. C.:* HARRY B. DUNDON, JR., appointed general foreman. *Atlanta, Ga.:* SCOTT A. COFLIN appointed general foreman.

Southern Pacific. — *San Francisco, Cal.:* F. E. RUSSELL appointed general superintendent, Mechanical Department-Engineering. N. L. MCCRACKEN appointed assistant general superintendent, Mechanical Department-Maintenance. LAUREN N. GRIFFITH, assistant mechanical engineer, retired. *Houston, Tex.:* A. I. SELLERS, acting superintendent, appointed superintendent, Mechanical Department, succeeding Mr. Russell.

Texas & Pacific. — *Dallas, Tex.:* JULIUS O. FRAKER, superintendent of diesel and electrical maintenance, appointed chief mechanical officer, succeeding T. E. Albright, former mechanical superintendent. Mr. Fraker, a graduate of Bucknell University,

J. O. Fraker
Texas & Pacific

began T&P career as electrician draftsman in shops at Marshall, Tex. Transferred to Dallas in 1937 as electrical engineer, subsequently becoming general electrical and shop engineer, electrical engineer and diesel supervisor, and superintendent of diesel and electrical maintenance.

FLEXIBLE HOSE ASSEMBLIES

Stratoflex "275" wire braid hose, with SF 426 and 435 reusable fittings, meets standard applications for railroad air brake lines. Hose is made from seamless synthetic rubber innertube, reinforced with one fabric braid and one high tensil steel braid in sizes -10 and -12. Sizes -16 and -24 are reinforced with two steel wire braids. For complete information on Stratoflex "275" Flexible Hose Assemblies, write for SF-275 mailer today.

SF3-0

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Today...automation has truly entered the railroad cleaning field. Through the miracle of "silent sound," Turco's new Ultrasonic Cleaning Process accomplishes *automatically in one short minute* what used to take manual labor a full half hour of tedious hand work. Moreover, with Turco Ultrasonics on the job, cleaning is *more* complete and is accomplished in even the most inaccessible recessed areas. For example, when utilized to clean air brake valves, the new Turco process simultaneously removes grease, oil and carbon, brightens the brass valves, and frees rings and valves for ease and economy of subsequent dissassembly.

AVAILABLE FOR ANY NEED

Turco Ultrasonic Cleaners now in actual use by railroads range from small bench models all the way up to the custom-engineered, conveyorized 100% automatic "push button" installations for central overhaul depots.

SAFER — CLEANER

No need for employees to touch the cleaning solutions or solution-covered parts. Eliminates mess and reduces hazards in manual cleaning areas.

FREE! VALUABLE 21-PAGE *Ultrasonic* CLEANING FILE! *including...*

1. **"Primer of Ultrasonic Cleaning"**—Principles of Ultrasonic Cleaning, How it Works, Where it Can be Used, Advantages & Disadvantages, etc.
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Please send, without cost or obligation, your 21-page File on Ultrasonic Cleaning

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TITLE_____

LC

Chemical Processing Compounds & Equipment

TURCO PRODUCTS, INC.

Offices in Principal Cities
24600 South Main Street, Wilmington, California

FACTORIES: Newark, Chicago, Houston, Los Angeles, London, Rotterdam, Sydney, Mexico City, Paris, Montreal, Hamburg, Manila, Naha (Okinawa)

Supply Trade Notes

TURCO PRODUCTS, INC.—*Robert Erlenbaugh* appointed area supervisor of railroad sales, Midwestern Zone.

■

OAKITE PRODUCTS, INC.—*Daniel P. Brennan* appointed technical service representative in midtown New York, succeeding *Edmond Malone*, who has been transferred to New Jersey.

■

J. W. MORTELL CO.: Following reorganization, *John L. Mortell*, executive vice-president and treasurer, elected president and treasurer; *D. E. Mortell* elected vice-president and general sales manager, and *R. J. Mortell* elected vice-president and eastern sales manager.

■

D. W. ONAN & SONS INC.—*Mathias M. Antz* appointed manager, southeastern United States, with headquarters in Atlanta, Ga. *Edward A. Hafner* and *George H. Rentschler, Jr.*, appointed to original equipment manufacturer sales.

■

FLANNERY PRODUCTS CORP.—Following appointed to handle company sales on a regional basis: *William E. Evans*, P. O. Box 11488, Pittsburgh, Pa.; *Charles E. Barnes*, 74 New Montgomery st., San Francisco 5, Calif., and *Otto Bussenius*, 80 East Jackson Blvd., Chicago 4.

■

UNITED STATES STEEL CORP.—*Carroll R. Justice* appointed vice-president—sales of United States Steel Products Division, succeeding *William I. Hanrahan*, retired.

■

AIR REDUCTION SALES CO.—*Blaine G. Harrington* appointed manager, Kansas City, Mo., district, succeeding *J. O. McElligatt*, retired.

■

ARCHER-DANIELS-MIDLAND CO. — Sales agents: *W. B. Replogle*, Branford, Conn.—New England railroads; *Canadian Bronze Co.*, Montreal—Canadian roads.

■

T-Z RAILWAY EQUIPMENT CO. — *James E. Friend* appointed southwestern representative.

■

TOWNSEND CO.—*Richard A. Villacres* appointed sales manager in charge of Cherry Lockbolts for railroad operations, Cherry Rivet Division, Santa Ana, Cal.

■

SYMINGTON WAYNE CORPORATION, SYMINGTON DIVISION.—*D. L. Towsend*, vice-president—Western sales, retired. *J. W. Bergen*, assistant vice-president, appointed manager of Western sales, and *D. L. Munro*, service engineer, appointed sales engineer. Headquarters, Chicago.

■

FARR CO.—*Kenneth DeBaun* appointed district sales manager at new San Francisco, Cal., sales offices. Mr. DeBaun formerly district manager at New York.

■

KENNAMETAL INC.—Kennametal has moved from 3701 N. Broad st. to 1349 W. Cheltenham ave., Philadelphia 26, Pa.

WHEEL SHOP worker applies measured amount of grease with GRACO roller bearing lubricator.

Getting 'em ready to roll...with Graco air-powered pumps

● Getting railway equipment ready to roll at Union Pacific's Omaha shops is a job that's tailor-made for GRACO air-operated pumps.

Shown above, for example, is a GRACO roller bearing lubricating unit that dispenses exact, measured amounts of grease direct from the original 400 lb. drum . . . provides a neat and accurate procedure for filling and metering grease into roller bearing housings.

Portable air-operated bearing lubricators for use with original 120 lb. drums and hand-operated bearing lubricators that dispense right out of original 25-40 lb. refinery pails are also available from GRACO. For complete information, write to the address below.

Investigate all three!

HAND-OPERATED ROLLER BEARING LUBRICATOR
Ideal for servicing roller bearings while cars are in the yards. Keeps lubricant clean from refinery to bearing.

AIR-OPERATED PORTABLE LUBRICATOR
Can be wheeled wherever needed to apply exact, measured amount of grease. Mechanical application saves grease, time, and dollars.

AIR-OPERATED STATIONARY LUBRICATOR
Assembly includes air-powered pump, drum cover, follow plate, air supply screen, air regulator with gauge, material hose, and control valve with one quart meter.

GRACO
GRAY COMPANY, INC.
Railway Department
982 Graco Square • Minneapolis 13, Minn.
Representatives in: New York, Philadelphia, Washington, Cleveland, Chicago, Louisville, Houston, St. Louis, Minneapolis, St. Paul, San Francisco, Montreal.

ELECTRIC STORAGE BATTERY CO.—*Robert L. Clark*, railway sales engineer, Chicago district, Exide Industrial Division, transferred to Philadelphia, Pa., as railway market manager.

OBITUARY

HENRY G. WILD, 70, former president of the Prime Manufacturing Company, died Wednesday, August 3.

HELPS FROM MANUFACTURERS

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information write direct to the manufacturer.

SPRING PLANKS. 4-page bulletin describes and illustrates spring planks available for original equipment or replacement for all type trucks. (Write: *Paxton & Vierling Steel Co., Owen Railway Supply Co., Div.*, Omaha, Neb.)

SOLID LUBRICANTS. Theory and practice of lubrication by solids primary subjects in 24-page booklet, "What Is Molykote?" Discusses boundary friction and role of solid lubricants to reduce friction and wear under heavy loads and at high temperatures. (Write: *Alpha-Molykote Corp.*, Dept. RLC, 65 Harvard ave., Stamford, Conn.)

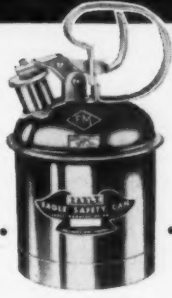
LATHES. 96-page Catalog 1960 shows complete line of engine lathes, toolroom lathes, turret lathes, milling machines, shapers, drill presses, and pedestal grinder. Large section devoted to tools, attachments and accessories for use with the various machines. (Write: *South Bend Lathe, Inc.*, Dept. RLC, South eBnd 22, Ind.)

DIESEL GENERATOR SETS. 4-page folder describes and illustrates diesel generator sets for mechanical reefers. Sets designed and built around Detroit diesel engines and are available in sizes from 10- to 30-kw. (Write: *Stewart & Stevenson Services, Inc.*, Dept. RLC, 4516 Harrisburg blvd., Houston 11, Tex.)

CAR RETARDER. 4-page folder from Railroad Products Division of ABS describes and illustrates new mechanical car retarder which brings rolling cars to a stop at the ends of yards; resists their further movement from impact of succeeding cars; and eliminates the need for skates. Can be used also at car cleaning tracks. (Write: *Dept. A, American Brake Shoe Co., Dept. RLC, 530 Fifth ave., New York 36.)*

FLUORESCENT ENAMEL. 4-page folder descriptive of high-visibility Pyralux fluorescent enamel for safety and decorative painting of vehicles and signs is printed in hyperintense fluorescent colors—vermilion, yellow, orange, and red—each of which is said to possess four times the daylight brightness of conventional hues. (Write: *Du Pont Co., AP-63, Dept. RLC, Wilmington, 98, Del.)*

Quality cans
EAGLE SAFETY CANS

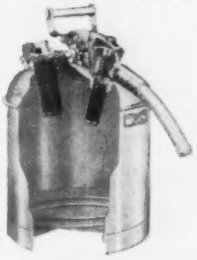


The approved *safe* way to handle flammable liquids • Listed by Underwriters Laboratories • Approved by Factory Mutual • Uncommonly rugged for hard use • 'The Complete Line'

STYLE I STORAGE CAN
1 qt., 2 qt., 1 gal. sizes with trigger-grip handle . . . 2½ gal., 5 gal. sizes with free-swing handle . . . valve operated by handle gives positive pouring control . . . no waste, no splash, no spill . . . strong quality construction.

ORDER FROM YOUR SUPPLIER

STYLE II FILLER-DISPENSER CAN
2½ gal., 5 gal. sizes with free-swing handle . . . flexible spout for easy pouring . . . body and breast each seamless drawn from heavy 24-gauge steel . . . steel hoop reinforces bottom . . . fire screens in pour spout and filler opening for double fire protection.



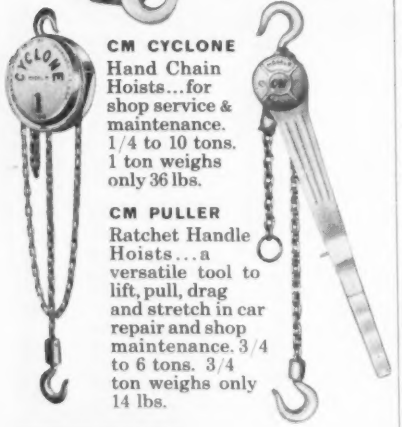
Write for free catalog showing Complete Eagle Line

EAGLE MANUFACTURING CO. Wellsburg, W.Va.
Serving Industry Since 1894

CM METEOR
Wire Rope Electric Hoists...for heavy overhead handling. 1/2 to 5 tons. Single or two speed. Plain, geared or motor driven trolley.

RUGGED CM® HOISTS
FOR GENERAL SHOP USE AND REPAIR FACILITIES

CM LODESTAR
Electric Chain Hoists ...ideal for truck handling in spot car repair facilities and for general shop use. 1/8 to 2 tons. Hook or trolley suspension.



CM CYCLONE
Hand Chain Hoists...for shop service & maintenance. 1/4 to 10 tons. 1 ton weighs only 36 lbs.

CM PULLER
Ratchet Handle Hoists...a versatile tool to lift, pull, drag and stretch in car repair and shop maintenance. 3/4 to 6 tons. 3/4 ton weighs only 14 lbs.

CM HOISTS

Send for Bulletins and name of local distributor

CHISHOLM-MOORE HOIST DIVISION
Columbus McKinnon Chain Corporation
Tonawanda, New York
quality, dependability and safety for more than 75 years

Santa Fe Plow

(Continued from page 40)

guided by the rotor speed indicator to maintain an effective plowing speed.

If the rotor speed goes over 140 rpm and the overspeed circuit fails, the throttle is reduced to idle rapidly to prevent rotor being thrown apart. The rate of plowing heavy drifts is governed by plow capacity and the power of the diesel engine supplying it. A 1,350- or 1,500-hp diesel will supply all the power the plow can safely handle. Power is determined by the current rating of the traction motors in the plow.

The ground relay light on the rotor control stand has two functions. If the light comes on and the power is cut off, the ground relay has operated, and the same precautions are taken as with a locomotive unit. If the light comes on and stays on and the operation continues normally, the over-current relay has operated, indicating the diesel engine on the power unit is being overloaded. Forward speed of the snow plow is then reduced until the light goes out. Momentary operation of the light may occur when initially starting the rotor and may be disregarded. The throttle is operated one notch at a time. The rotor can be operated in either direction. Position of the deflecting scoop at top of rotor is changed to correspond with direction of rotation.

A Vapor steam generator provides heat for the cab and supplies steam for melting nozzles behind the rotor. The nozzles are turned off when the plow is not working, because steam will enter the engineroom around the shaft and cause moisture to accumulate in the electrical equipment. Traction motors in the plow are cooled by air taken in through openings at rear of carbody and carried through ducts along ceiling to traction motor blowers. Impingement air filters are placed in the ducts at rear of carbody. The doors in the duct work above the air intake filters can be kept open to recirculate air in the engineroom, although it is preferable to take outside air. Air discharged by the traction-motor blowers pressurizes the engineroom and tends to prevent entrance of snow through any openings.

Total weight of the plow is 273,685 lb. Total length is 50-ft 4¾-in.; wheel base, 34-ft 10-in.; rotor diameter, 10-ft, and width of rotor funnel, 11-ft 2½-in.

Promoted again! How does he do it?

Why do some men get ahead faster than others? Usually because they have better technical training.

Fortunately, it's not difficult to learn new skills for your present railroad job—or prepare for better jobs in railroading. You can do it at home—in your spare time—through the excellent technical training service offered by the Railway Educational Bureau.

The Railway Educational Bureau, organized over 50 years ago by the Union Pacific Railroad, soon became an independent organization serving employees on all American railroads. Today over seventy railroads co-operate in making the Bureau's wide scope of service available to their employees. On the Bureau's Individual Service Plan, instruction, assignments and evaluation are handled entirely by mail. The low enrollment cost (less than 17¢ per day) entitles you to a wide selection of subjects.

SEND THIS COUPON

We will mail you full details. Remember —*study clears the road to progress!*

The Railway Educational Bureau
1809 Capitol Avenue, Omaha 2, Nebraska

I am interested in subjects related to the railroad jobs checked below. Please send full details. I understand this inquiry will not obligate me in any way.

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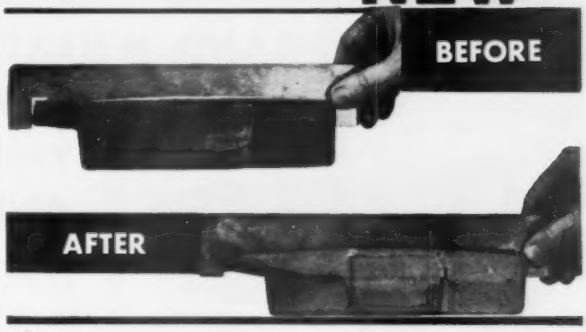

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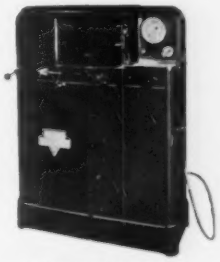

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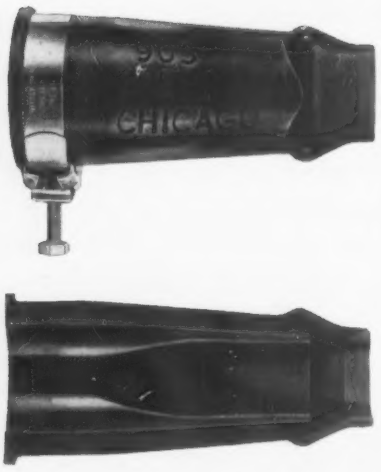

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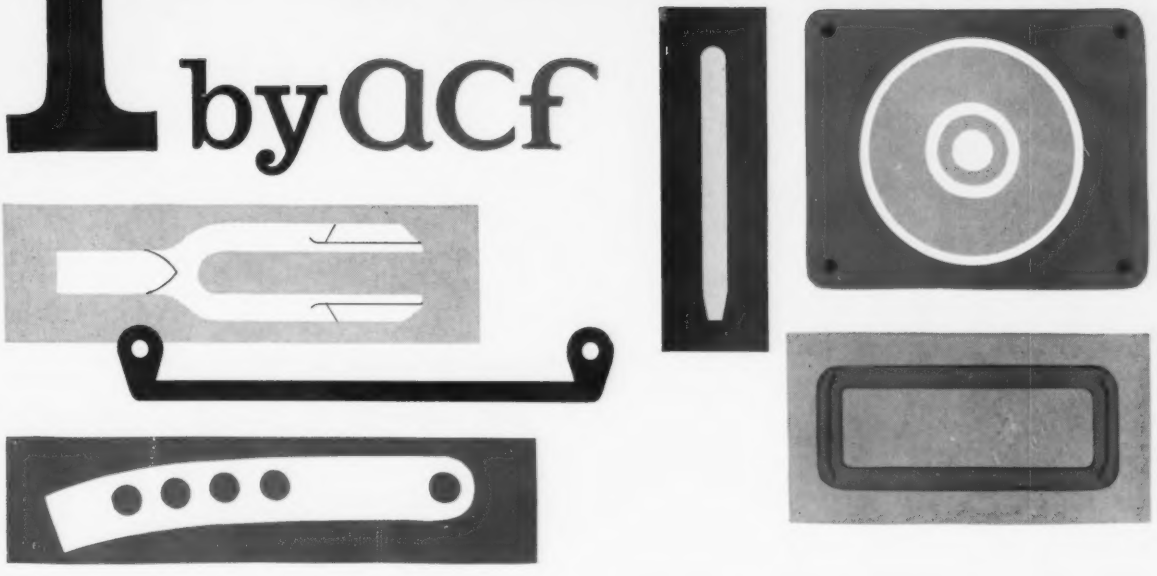

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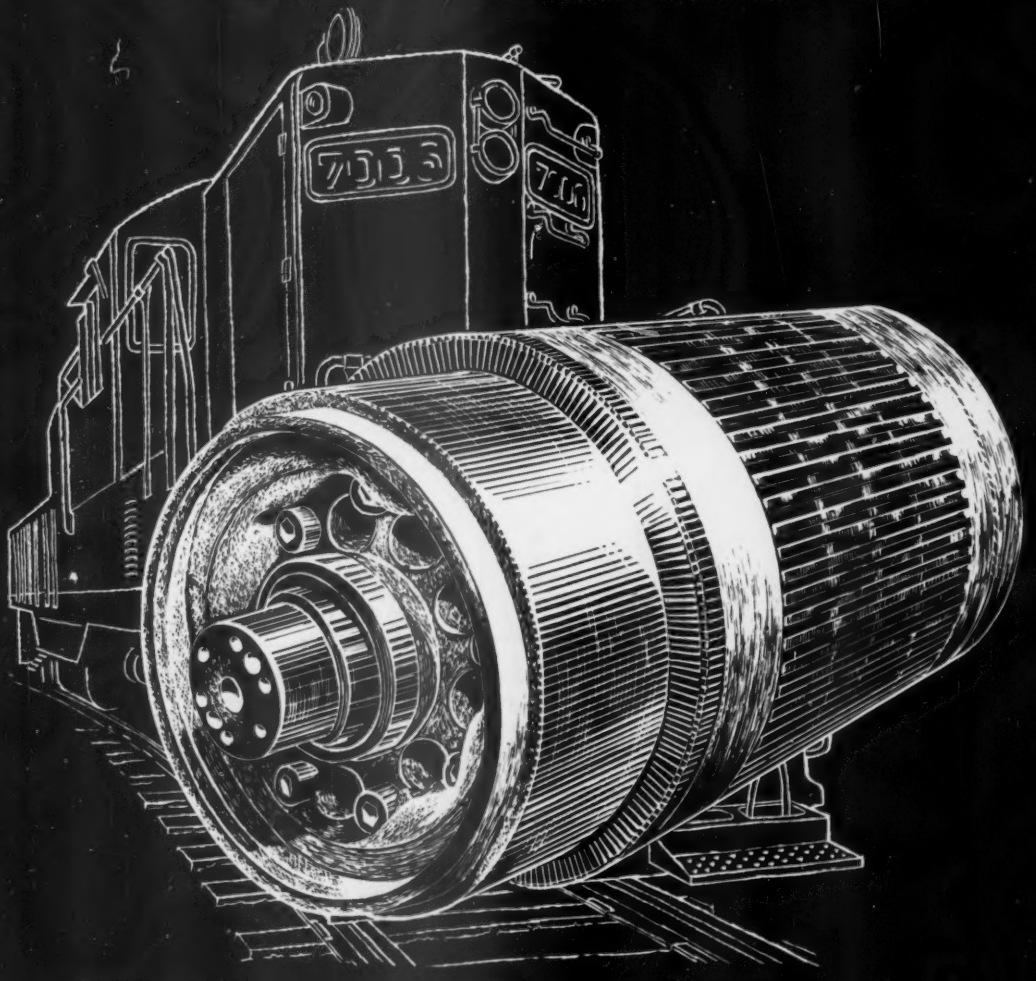

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